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Where Wellness Begins

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Where Wellness Begins:

A Design Approach for Occupant Health using Visual and Non-visual Effects of Daylight

Occupant wellbeing and health has become an increasingly relevant topic in the architectural discourse. Studies such as that of Plotnick have connected increased instances of obesity, diabetes, asthma, and depression to specific demographic regions¹. This suggests a direct correlation between an occupant's health and their built environment. Organizations such as the AIA and Delos have developed a series of Health Action plans and the WELL Building Standards (respectively) that suggest health-promoting standards of design to mitigate the nations declining health though evaluative methods². While these programs have made great strides in the promotion of health/wellbeing, they rely heavily on post design evaluations. This thesis seeks to align itself with the WELL Building Standards by suggesting a formulaic approach to schematic design that will promote wellness through spatial form building at the initial stages of design.

The design process proposed by this thesis suggests the utilization of nine categories of health promotion that address the physical, social, and mental components of occupant well being. These elements can be broken down into three categories of interrelated elements with associated design principles: 1) daylight, fresh air, and vegetation 2) nutrition, physical activity, and community 3) medical need, alertness, and occupant satisfaction. Each design should focus on the elements that are most important to the site-specific demographic needs and be utilized to compose a series of human-centric spatial studies. As such, this thesis contends that if occupant health is placed at the forefront of

design, utilizing a design approach that selects and addresses three out of nine suggested elements of health based on demographic mapping in a spatial/human-centric manner during the initial stages of design the resulting architecture will promote occupant wellbeing.

In support of this thesis, this project will focus on the development of a single element of health: daylighting. This examination will quantitatively and qualitatively observe the visual and non-visual effects of daylighting on occupant health. This examination aims to juxtapose the methods of daylight evaluation with a human-centric view of daylight while observing the subsequent health effect (immune support, vitamin D production, regulated body temperature, stimulated metabolism, improved circulation, circadian rhythm/melatonin production)³. The produced framework will be applied in the Near Westside of Syracuse, NY through the redesign of an existing educational facility: Westside Academy of Blodgett. The school will focus on the incorporation of daylighting techniques following the proposed method of schematic design and will be evaluated using the simulation tool DIVA to examine the daylighting effects on occupant health and wellbeing.

1-Mike Plotnick, "Designs on Health: New Research Advances the Alignment of Design and Public Health," Architect 103.11 (2014): 48-49.

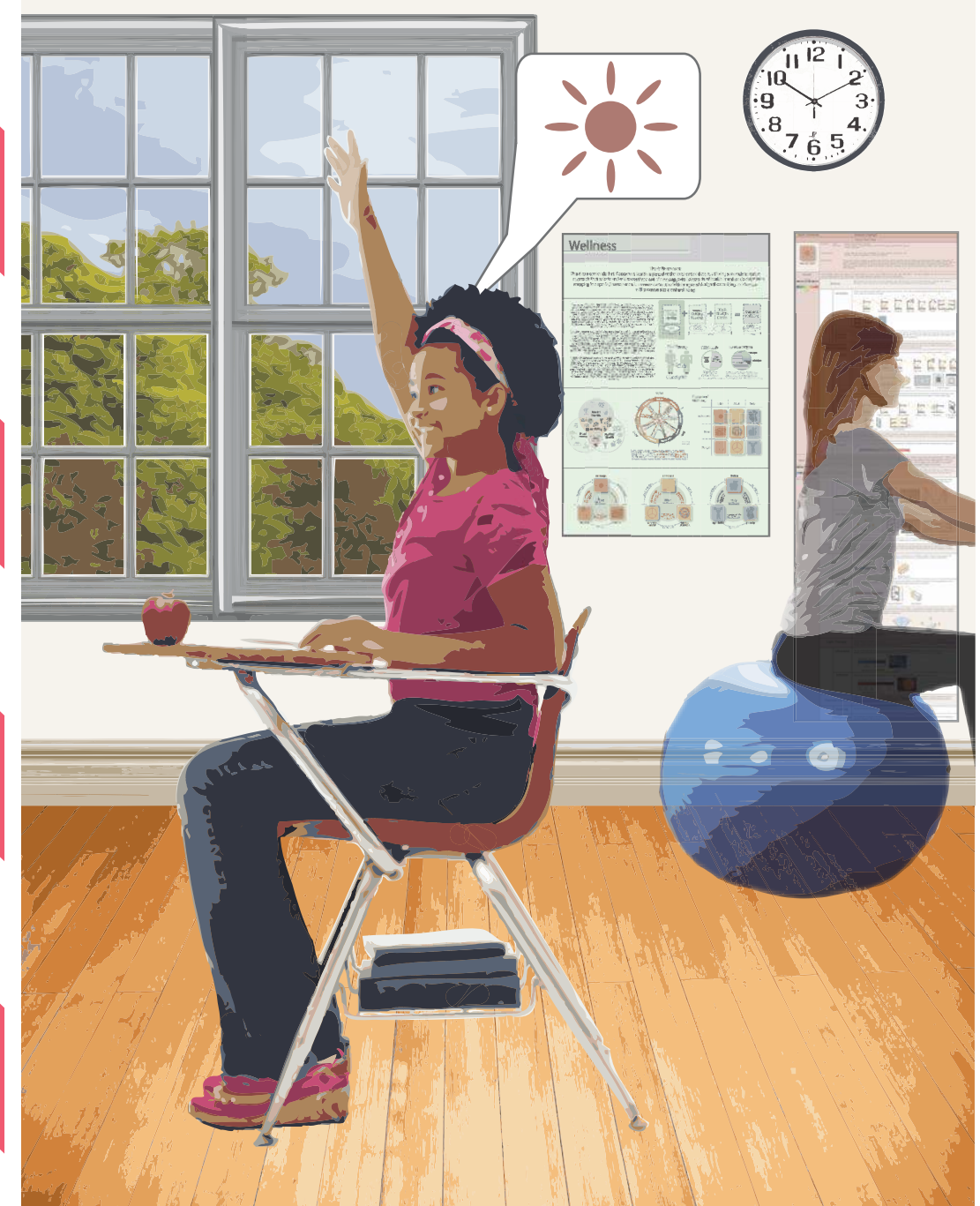
2- Mike Plotnick, "Action Plans: Energy, Materials, Health, Resilience, and the Near Future," Architect 103.1 (2014).

3-John Stanislav Sladar, "Beyond Blue: The Non-Visual Effects of Light and Colour in Architecture," Architecture Theory Review 19.2 (2014): 176-178.

Advisor: Tarek Rakha

CHELSEA WHEELER

c Dd Ee Ff Gg Hh Ii Jj Kk Ll Mm Nn Oo Pp Qq Rr S



This thesis contends that if occupant health is placed at the forefront of design, utilizing a proposed process of design that selects and addresses three out of nine suggested elements of health through demographic mapping and utilizes these elements to construct human-centric drawings during the initial stages of design, the resulting architecture will promote occupant wellbeing.

As ecological sustainability has become more established in architectural practice, there has been a renewed interest in the sustainability of occupant health. Studies show that Americans spend on average, ninety percent of their time indoors exposed to the environmental conditions supported by the built environment.¹ This means that the built environment has the potential to support or harm occupant health.

This notion is further supported by the research of Plotnick which suggests that a person's health and life expectancy can be linked to their zip-code.² This link between health and environment supports the development of sustainable health in modern architectural practices.

This argument does not support the notion that architecture can control occupant health but rather promote health and wellbeing at a mental, physical, and social level.

This movement towards sustainable health has been promoted by organizations such as the AIA and Delos. Such organizations seek to develop architectural standards for the promotion of well-building designs.

An Introduction To Wellbeing An Architectural Practice

Increased attention to occupant health suggests that architecture has a responsibility to create environments that promote occupant health and wellness.

1 - Julia Salerno, "Revolutionizing Human Health and Well-being In The Built Environment," Canadian Interiors 51.6 (2014): 15-17.

2 - Mike Plotnick, "Designs on Health: New Research Advances the Alignment of Design and Public Health," Architect 103.11 (2014): 48-49.

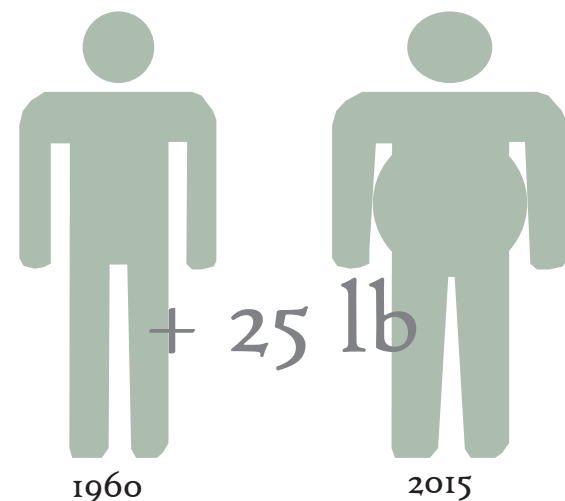
American health has been steadily declining since the 1960s.¹ Obesity, diabetes, asthma, and depression have all increased amongst both adults and children. The AIA Health Action Plan attributes greater instances of these disorders to environmental factors such as the increased cost of health care, aging baby boomers, and poor diet.² The New York Health Foundation further defined the decline in health as a function of poor health education, inaccessible food sources in urban environments, and a lack of safe environments in which one can exercise.³

In addition to the lack of health source availability, increased efforts to create net zero buildings has created potentially hazardous living conditions. Studies conducted by the MEARU research unit on twenty modern residential complexes designed to meet level 3 and 4 sustainability codes in London have become so air tight, relying heavily on ventilation machinery, that indoor CO₂ levels have dramatically increased (peaking around 3250ppm).⁴ This reduction in air quality has the ability to reduce respiratory function and create a drowsy atmosphere. These results were compounded by thermal discomfort created by the over reliance on mechanical ventilation systems and oversized windows that lacked shading devices. Attempts to create ecological sustainability have adversely effected occupant health giving rise to the need for sustainable health practices that reclaims the occupant as the focus of architectural design.

Why WELL - National Need For Improved Health

Effects of Decreased Health:

Adult Obesity

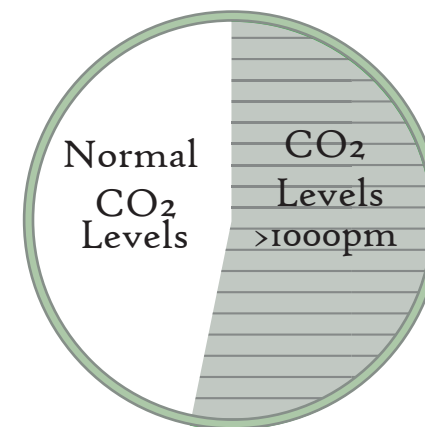


Obesity X2

American obesity among adults has doubled since the 1960s with the average modern adult weighing twenty five pounds more than their 1960 counterparts. Obesity can lead to heart disease, diabetes, and depression.

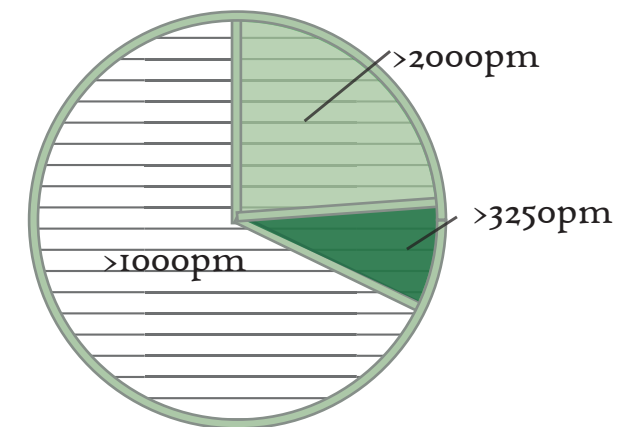
Effects of Sustainable Design Process:

CO₂ Levels



54% of Time
CO₂ > 1000pm

Levels >1000pm



CO₂ Levels Peak @3250pm -
4000pm causes Direct Harm

Information according to Mackintosh Environmental Architecture Resource Unit and Cartwright Pickard Architecture

These graphs describe conditions found in twenty new residential buildings in London designed to support ecological sustainability. Researchers used 1000pm CO₂ levels as a benchmark number. All levels below this level were considered to be normal and healthy. Levels above 1000pm were considered to be reduced air quality with mild health effects. 4000pm is considered to be the point at which the air quality has significant, noticeably adverse effects on occupant health. Levels consistently peaked above 3000pm just years after construction. This is not a healthy environment and if the issues are not addressed as the building ages and equipment continues to fail, the building will become even more hazardous to occupants.

1 - Plotnick, Mike. "Designs on Health: New Research Advances the Alignment of Design and Public Health." Architect 103.11 (2014): 48-49. Web. 1 Sept. 2015.

2 - Plotnick, Mike. "Action Plans: Energy, Materials, Health, Resilience and the Near Future." Architect 103.1 (2014): 46-48. Web. 1 Sept. 2015.

3 - "Full List of Selected Recipients For 'Healthy Neighborhoods fund'," NYS Health Foundation, accessed November 2015, nyshealthfoundation.org/our-garantees/healthy-neighborhoods-fund-recipients

4 - James Pickard, "Are Our Homes Making People Sick? A Focus on Sustainability Has Made Today's Housing Far More Energy Efficient, But Mackintosh Environmental Architecture Research Unit Suggests This May Have Been At The Unintended Expense of Occupants' Health," Architects Journal 242.5/6 (2015): 22-26.

Well-buildings are environments that take into consideration the health of the occupant during the design and construction of a building. Such considerations often result in the use of fresh air, daylighting, clear walkable circulation patterns, outdoor spaces, the incorporation of vegetation, and improvement of technology to improve the indoor environment. Improved indoor environments have the ability to effect occupant satisfaction, productivity, alertness, and health.¹This can be particularly effective at home, work, and school (places that people spend significant amounts of time).

In order to evaluate the effectiveness of such building alterations, Delos designed the WELL building standards to guide the designer in the completion of built environments in order to promote occupant health. The results of these standards is demonstrated in the analysis of the first WELL certified office building, the CBRE Global Headquarters.²The build was evaluated using a survey of workers. According to the results, the building improvements had a profound impacts on occupant behavior, mood, alertness, and satisfaction.

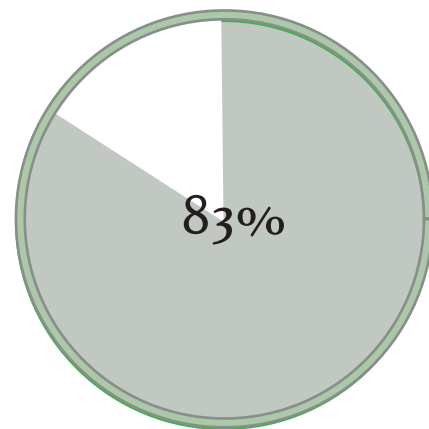
Post occupation surveys demonstrated higher levels of worker productivity and satisfaction. Eighty three percent of workers believed that they were more productive, one hundred percent of workers were interested in the new environment and felt encouraged to come to work, ninety two percent of workers felt healthier, and ninety four percent of workers believed their performance had improved.²

More quantitative evaluations of building performance are underway for WELL certified buildings however are not fully developed due to the relative short life of the program as it exists today. A general decrease in sick days has been observed.

Why WELL - Benefits Of Well Building

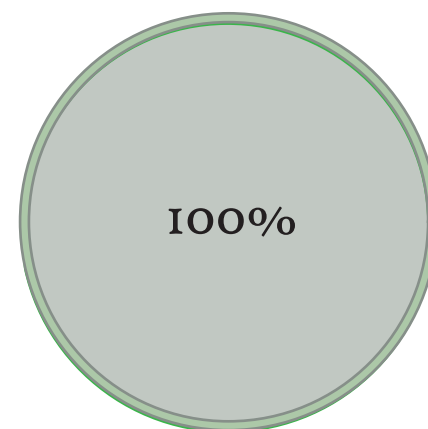
CBRE Post Occupancy Evaluation Results:

Productivity



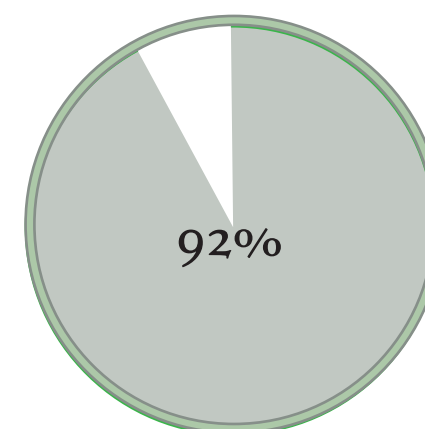
83% Believed There Was An Increase in Worker Productivity

Interest



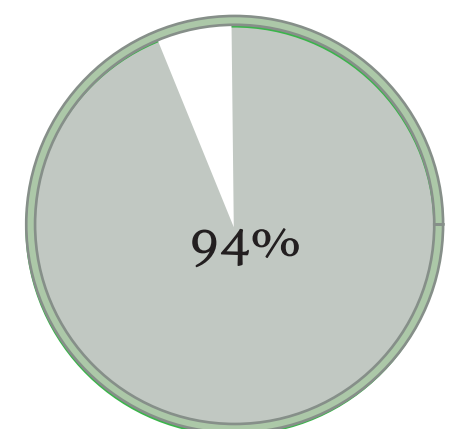
100% Interest in/Desire For Healthy Environment

Healthier



92% Believed They Felt Healthier - Positive Effects

Performance



94% Believed Their Performance Increased As A Result Of Environment

Information in accordance with wellcertified.com WELL Building Standards

The WELL Building Standards were developed by Delos Architecture as a design guideline for sustainable health in architecture. WELL is intended to act as a counterpart to the LEED Building Standards (a guideline for environmental sustainability). Both WELL and LEED operate as a post evaluative guide that awards points for the achievement of various design objectives in order to earn certification. WELL was established in corporation with the IWBI - International Well Building Institute and is administered by the GBCI - Green Building Certification Institute.

The WELL Building Standards are a set of design features related to occupant health that are used to evaluate the efficiency of a building after its construction. Points are awarded to buildings that comply with the set standards to achieve certification. The WELL Building Standards contain over one hundred design features sub categorized into seven health promoting concepts.

Seven Elements:

- Comfort
- Light
- Nourishment
- Water
- Air
- Mind
- Fitness

WELL Building Standards



WELL Building Standards are designed according to a set of tables outlining one hundred health supporting design features. These features/criteria are then broken down into performance and descriptive Standard. Performance standards are based on architectural elements an general composition. Descriptive standards are based on mechanical incorporation; the use of technology to improve the environment.¹

There are three levels of WELL certification; silver, gold, and platinum. As such, these standard can be further divided into optional or preconditioned (based on the level of WELL desired). Preconditioned standards are required elements and optional elements can be used to acquire additional points towards a higher certification. As such, achieving the preconditioned standards may earn a building a silver certification, the additional achievement of optional standards may bust the building to a gold or platinum certification.¹

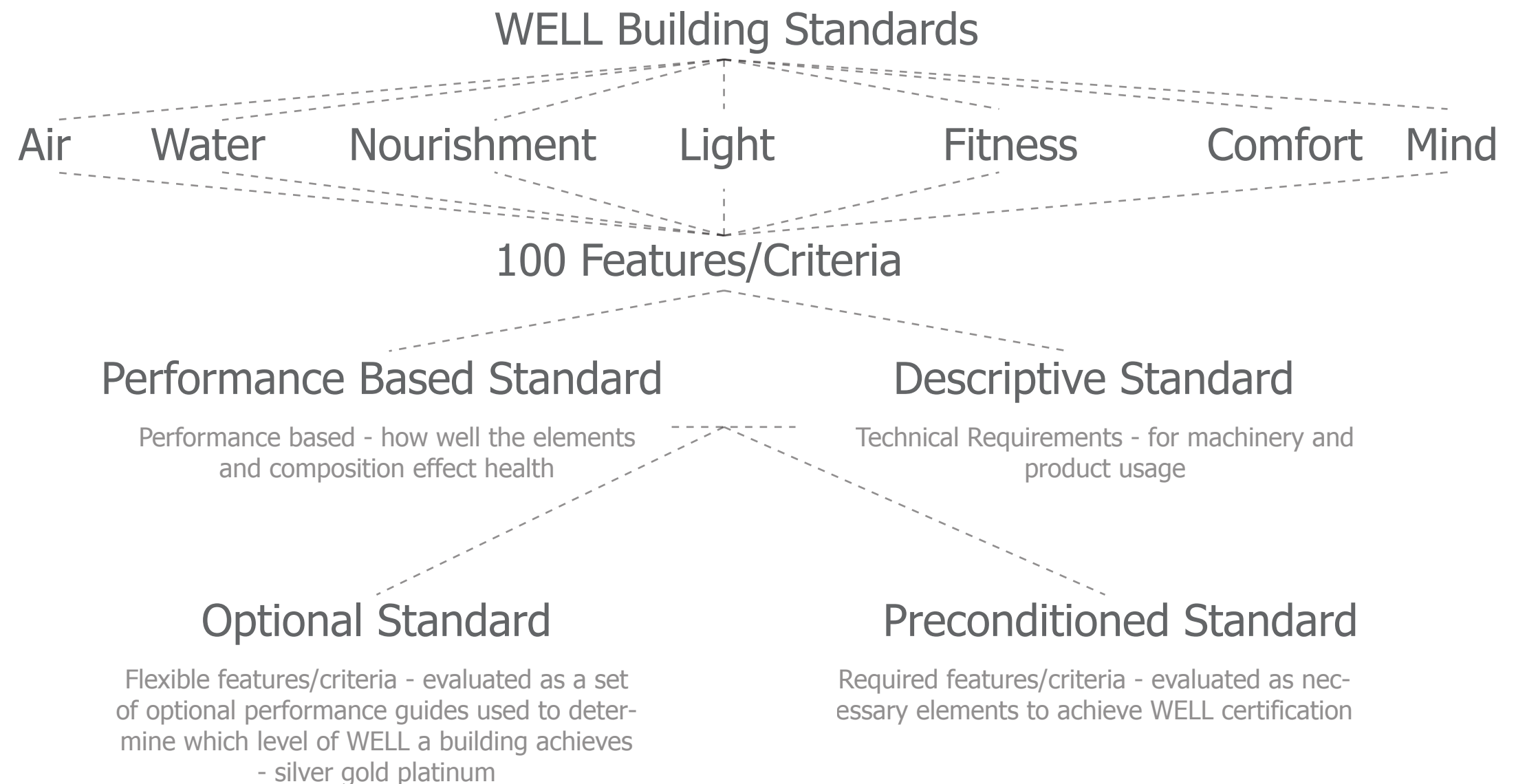
There are three sets of standards used for different building types: New and Existing Buildings, New and Existing Interiors, and Core and Shell. This allows for greater specificity in design requirements allowing for individual occupant needs to be addressed.

Building Type Classifications:

- ☒ New and Existing Buildings
- ☐ New and Existing Interiors
- ☐ Core and Shell

Understanding WELL

Evaluation Criteria :



The Restrictions Of WELL

WELL Building Standards have made great strides in the development and promotion of health in the built environment. This being said, the post construction evaluative method used by WELL fails to promote early considerations of health and well being. The benchmark list construction of the system can be seen as an after thought since there are no suggested interventions for the schematic design stage. WELL operates according to a developmental mindset as opposed to an architectural conception.

In addition to being evaluative, WELL relies heavily on the integration of technologies and product specifications. This could be enriched through the suggestion of traditional architectural organizations and principles to promote health through spatial articulation and building orientation. An over reliance on technology leaves a building vulnerable if the technology utilized in the construct mal-functions or is poorly maintenance as seen in the MEARU studies on CO2 levels.¹



**Macquarie – One Shelley St
Sydney, Australia**

Image courtesy of <http://www.wellcertified.com/projects/macquarie-%E2%80%93-one-shelley-street>

Spatial Solutions:

Daylit Atrium, Stairs, Skylights, Glass/Low Partitions,
Apertures, Orientation, Overlapping Spaces



**LYFE Kitchen
Clark Street Chicago IL**

Image courtesy of <http://www.wellcertified.com/projects/lyfe-kitchen-%E2%80%93-clark-street>

Technological Solutions:

Healthy Food Options, Air Purification System, Water Filters,
Innovative Lighting, Dirt and Virus Tracking, Photo Catalytic Coatings.

1 - James Pickard, "Are Our Homes Making People Sick? A Focus on Sustainability Has Made Today's Housing Far More Energy Efficient, But Mackintosh Environmental Architecture Research Unit Suggests This May Have Been At The Unintended Expense of Occupants' Health," Architects Journal 242.5/6 (2015): 22-26.

Precedent Studies Well-buildings

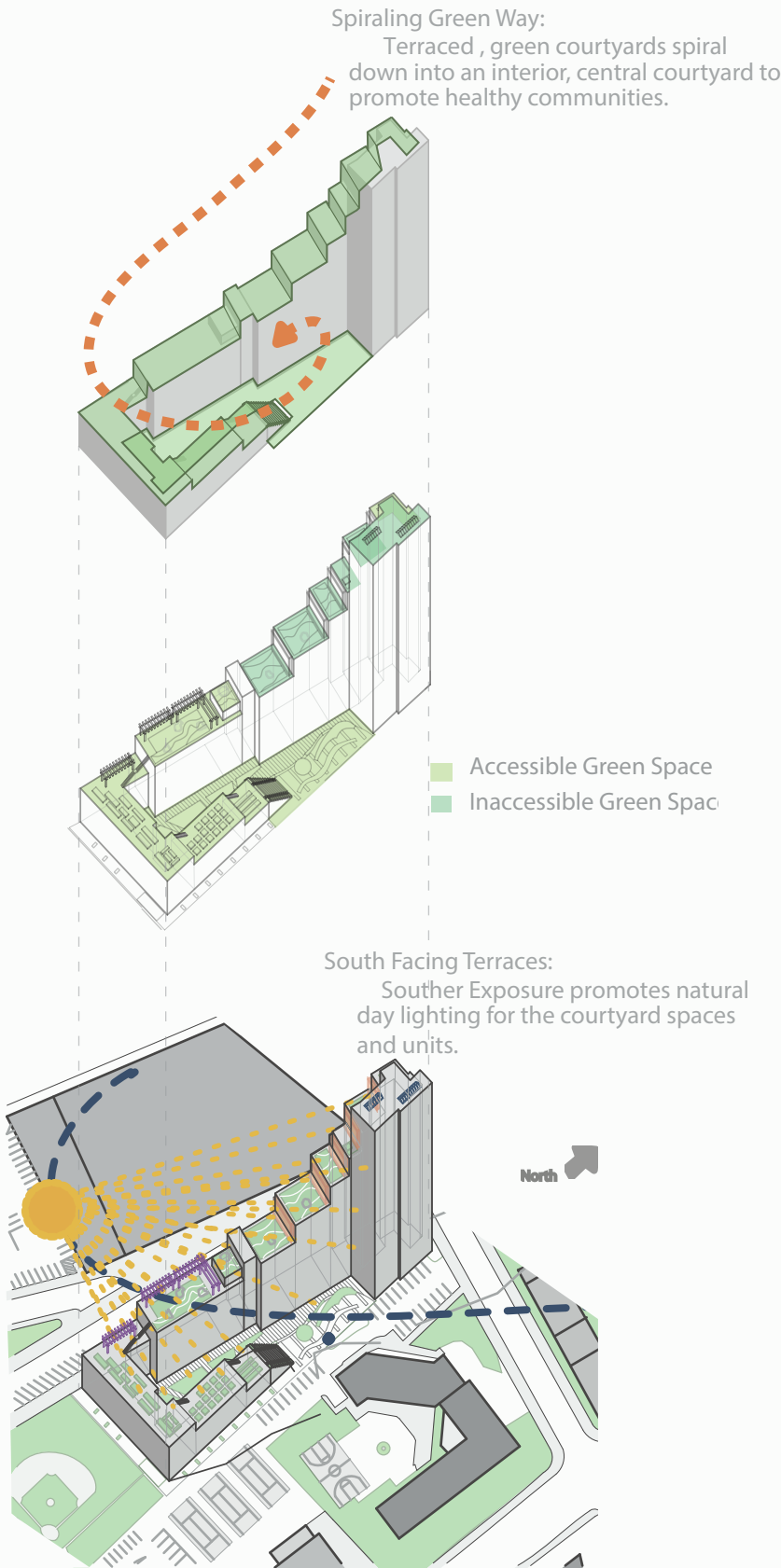
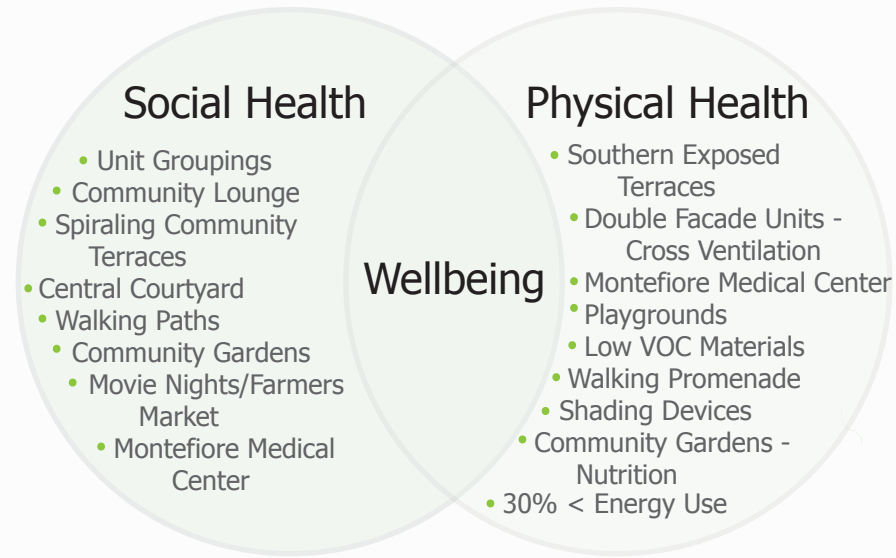
Precedent Via Verde, NYC

In preparation for the New Housing New York Legacy Competition, Dattner and Grimshaw visited the south Bronx and asked the residents what they hoped to obtain through the new development. The general consensus of the population was a healthy living environment. This became the driving idea of the design project.²

Architects:	Dattner Architects; Grimshaw Architecture
Developers:	Jonathan Rose Companies; Phillips House ¹
Date:	2012
Location:	700 Brook Avenue, South Bronx, New York City, New York
Lot:	60,000 sq ft – 1.4 acres
Residential:	296,000 sq ft
Commercial:	7,500 sq ft
Green Roofs:	34,000 sq ft
Open Space:	40,000 sq ft (6)
Units:	222
Rent:	151
For Sale:	71 (11)
LEED:	Gold Certified ¹

Concept

Create a physically and socially healthy living environment through the application of terraced green community spaces that spiral down into a central courtyard.



1 - "Dattner Architects and Grimshaw Architects Complete Via Verde." Architect Magazine, 2014. <http://www.architectmagazine.com/projects/view/dattner-architects-and-grimshaw-architects-complete-via-verde/525/>.
2 - Snider, Bruce. "Via Verde—The Green Way, Bronx, N.Y." Residential Architect: A Magazine of the American Institute of Architecture, 2013. <http://www.residentialarchitect.com/award-winners/via-verde-the-green-way-bronx-ny.aspx>.

Precedent Via Verde, NYC

Exemplar for designing spacial constraints based on social and physical health concerns.

Social/Mental Wellbeing:

Building off of the notion that a healthy living environment would need to foster both physical and social health,¹ Dattner and Grimshaw sought to create an environment that was differentiated to provide a sense of identity within the community, sub-divide the project to create a series of smaller more intimate communities, create joint community spaces that would foster a connection amongst all of the residents and the surrounding community, and ensure an active connection to the surrounding context/ provide the site with a spark of life through the incorporation of commercial spaces at the ground level.²

The creation of community spaces was crucial to the development of a socially healthy living environment. Common spaces allow for daily interactions, the development of friendships, and opportunities for community events that allow residents to grow (movie screenings and biweekly farmers markets).³ The central courtyard is seen as one of the most important communal spaces in the complex.³

Another important community space is the Montefiore Medical Center on the northern end of the ground floor.² The façade was designed to create a unified construct that fit into the neighborhood and could be constructed on a small budget without looking like low-income housing, allowing residents to feel a sense of pride for their residence.

Physical Wellbeing:

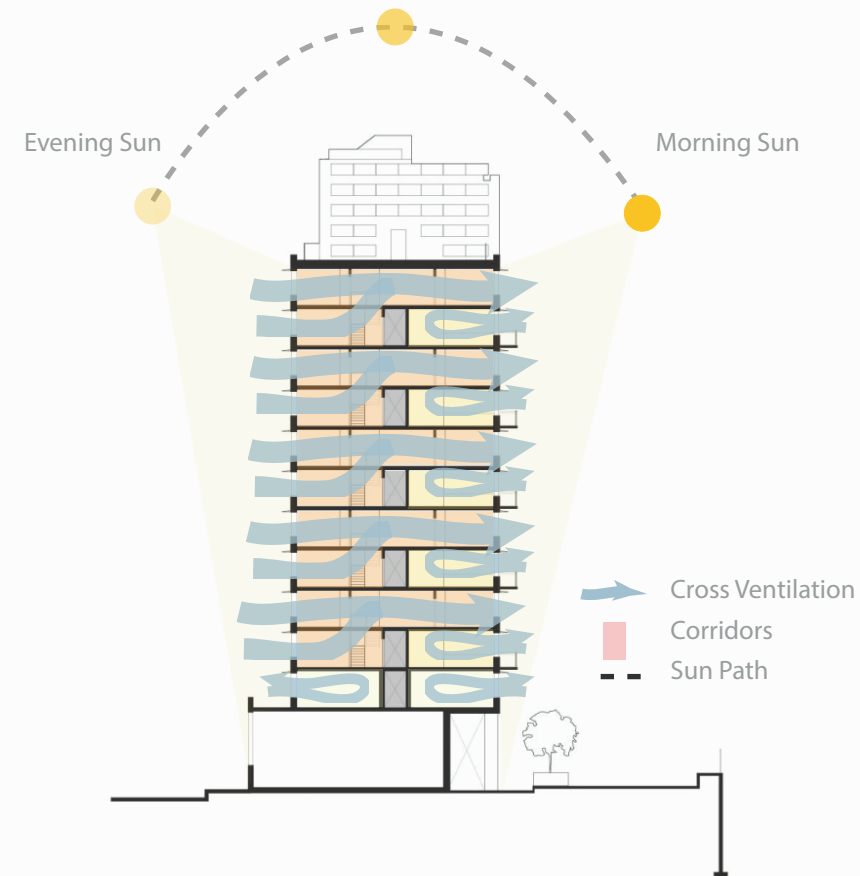
Dattner and Grimshaw also sought to combat regional health concerns facing the Bronx, one of the highest rates of childhood asthma in the nation and the national rise in obesity, through the incorporation of natural day light, natural ventilation, fresh air, exercise spaces, a community health clinic, green spaces, playgrounds, fresh produce, sustainable practices, and low or no volatile organic compound (VOC) materials.

The spiralling green promenade beginning within the central courtyard fosters physical health through the promotion of daily walking in a safe environment.¹ Well light, spacious, and ventilated stairwells encourage the use of stairs as a means of daily exercise further promoting a healthy living environment.

The Montefiore Medical Center offers family health care to residents and attempts to improve the physical health of the neighborhood, providing medical opportunities.¹

Environmental sustainability was seen as an opportunity to preserve a healthier environment for future generations. Material and energy conservation techniques were utilized to create a thirty percent more efficient building than comparable residential constructs.

The façade is a high-tech, prefabricated rain screen with advanced moisture barriers and good insulation, composed of three low VOC panels; cement, composite wood, and metal and large bay windows. Horizontal shading devices accompanied all windows for thermal comfort.² The high insulating properties of the rain screen combined with duel façade unit designs and large shaded apertures allows the building to reduce heating, cooling, and lighting needs while providing natural ventilation and day lighting that support occupant health.



Light And Air:

Cross ventilation and natural day lighting is provided by duel facades in 90% of Apartments. The Mid rise apartments seen hear are modeled after Le Corbusiers Unite d'Habitation and take advantage of a skip-stop corridor system to allow for natural light and air to enter the apartments in order to provide a healthy living environments



1 - "Dattner Architects and Grimshaw Architects Complete Via Verde." Architect Magazine, 2014. <http://www.architectmagazine.com/projects/view/dattner-architects-and-grimshaw-architects-complete-via-verde/525/>.

2 - Snider, Bruce. "Via Verde—The Green Way, Bronx, N.Y." Residential Architect: A Magazine of the American Institute of Architecture, 2013. <http://www.residentialarchitect.com/award-winners/via-verde-the-green-way-bronx-ny.aspx>.

3 - "Via Verde – The Green Way." Dattner Architects. Accessed November 22, 2014. <http://www.dattner.com/portfolio/via-verde/>.

Precedent High Line, NYC

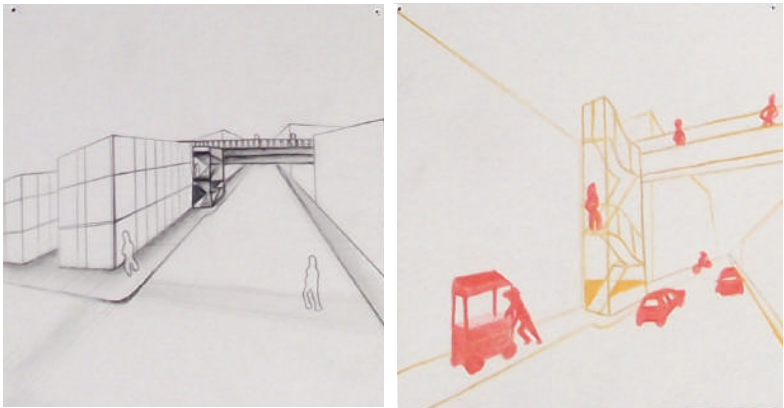
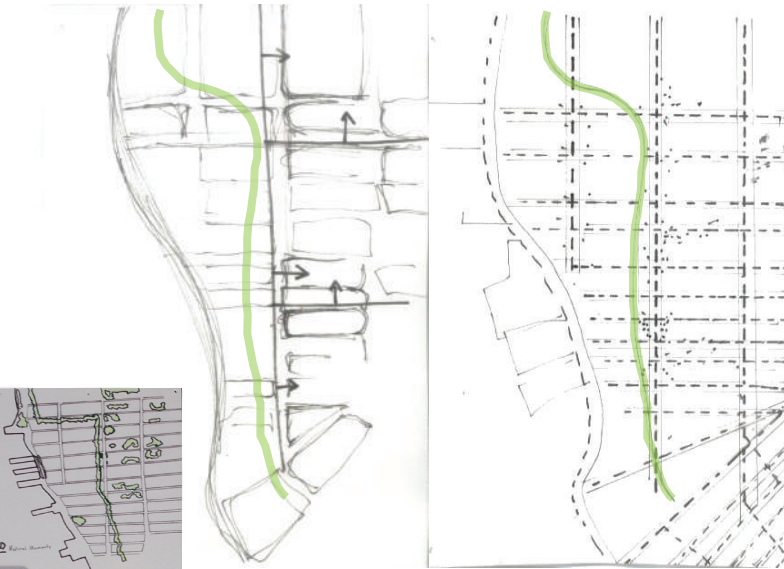
The High Line was created as a means of utilizing under used, unhealthy infrastructure within the city as a means of achieving a superior resident health through the introduction of social spaces that can accommodate social and physical activities. The High Line simultaneously promotes physical exertion and acts as a social network that connects people within the city to one another and extensive greenery while respecting the history of the city.

Architects:	James Cornerfeild Operations
Landscape Architect:	Diller Scofidio + Renfro
Plant Designer:	Piet Oudolf
Lobbyist:	Peter Obletz
Friends of the High Line:	Joshua David, Robert Hammond
Date:	2002-2014
Location:	Gansevoort St. - West 34th St. New York City, New York
Length:	1.45 mile
Height:	30 Foot Elevation
Structure:	Freight Rail Structure
Type:	Revitalization; Sustainability

Concept

The High Line seeks to adapt the infrastructure of the West Side Improvement Projects rail system into the modern urban environment and reclaim the beauty of the abandoned structures wild vegetation through the construction of social green spaces.

The High Line is a public improvement project that utilizes the 1934 West Side Improvement Project's raised rail system, which closed in 1980, create a leisurely social green space.¹The design founded by the Friends of the High Line utilizes a sustainable, historically conscious landscaping. The plants were inspired by self-seeded local vegetation that is drought resistant and a drip irrigation system. The construct offers various social events to promote social and physical wellbeing (i.e. Salsa Dances, Vendors, exercise classes, and artist events.)¹



Courtesy of Nozitep - Flickr



Courtesy of Taigatrommelchen - Flickr



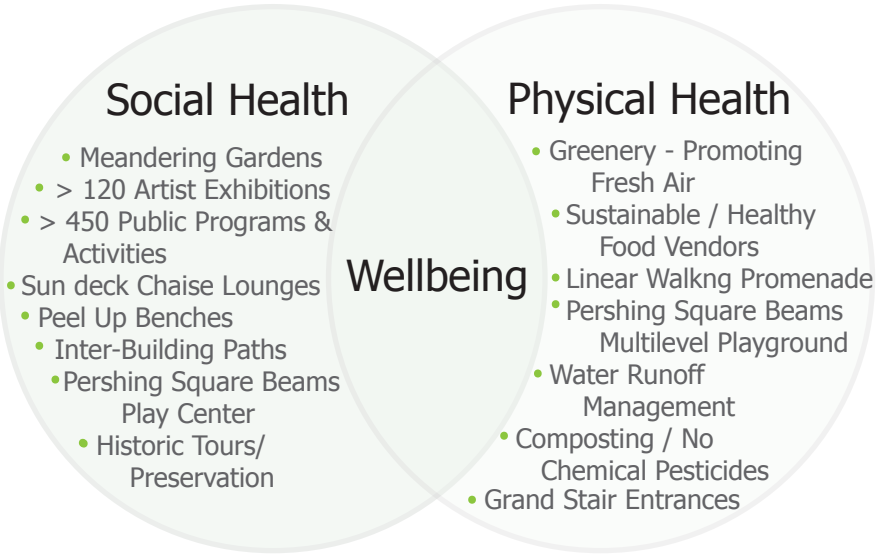
Courtesy of Taigatrommelchen - Flickr



Courtesy of Nozitep - Flickr



Courtesy of Westvillagebob - Flickr

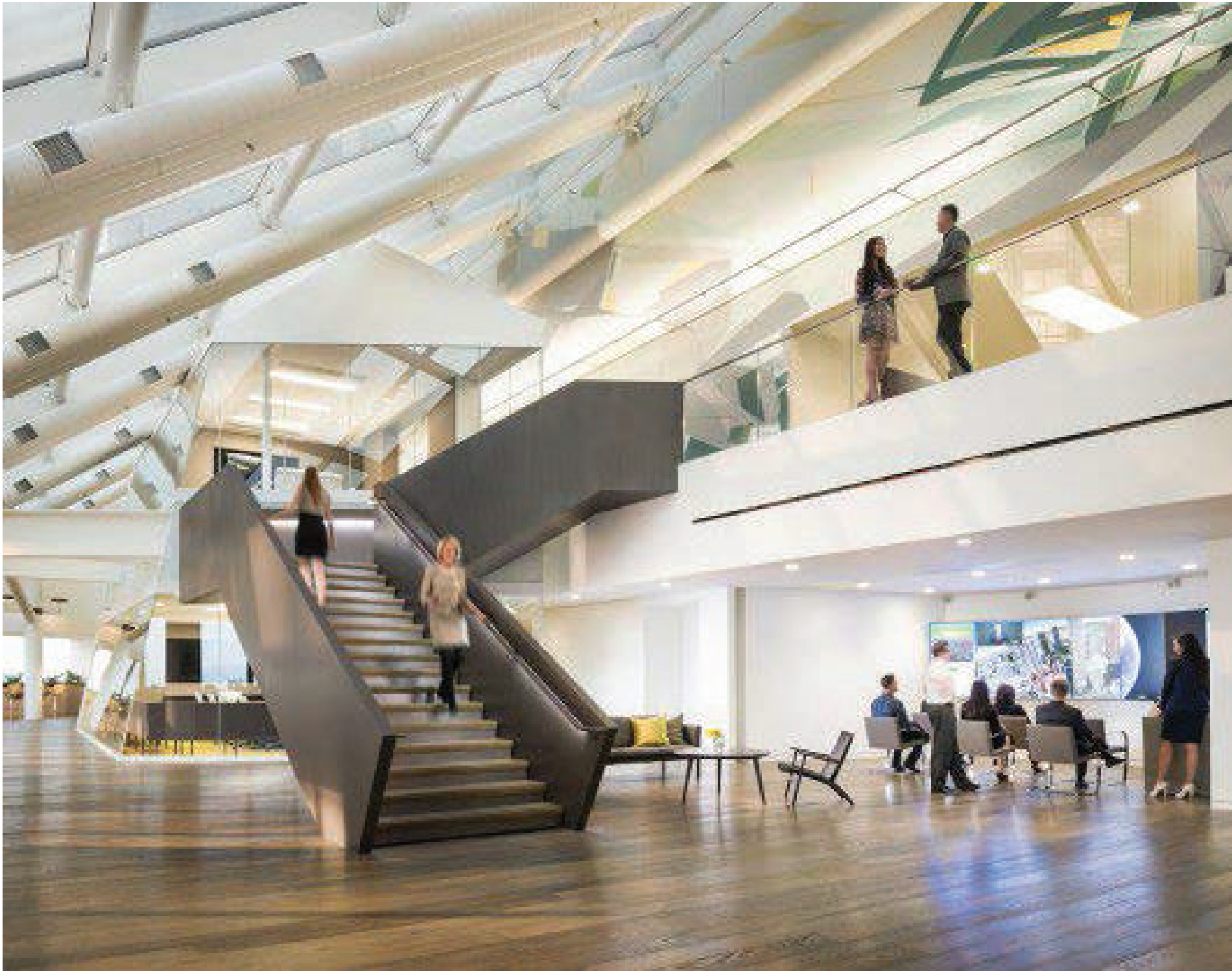
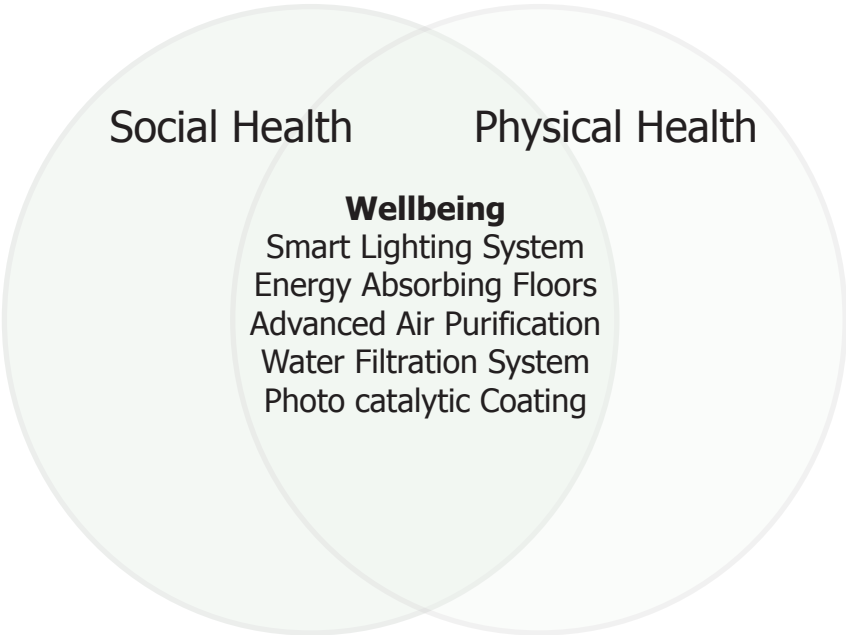


1 - "About the High Line | Friends of the High Line." The High Line. Friends of the High Line, n.d. Web. 01 Sept. 2015.

Precedent

CBRE Global Headquarters, LA¹

Architects:	Gensler Architects
Collaborator:	Delos
Date:	2014
Location:	11150 Santa Monica Boulevard Las Angeles, California 90025
Scope:	~15,000 sq ft - Two floors at the top of an existing high-rise
Office: Work Spaces:	15 Types
Awards:	Prestigious Global Innovators Award The Business Journal Best Tenant Improvement Award
LEED:	Certified
WELL:	Certified
Concept:	CBRE Headquarters was designed as the first application of the WELL Building Standards developed by Delos in an office building. The goal of the project was to construct a healthy work environment that would promote worker satisfaction, health, and increase productivity. ¹



1 - CBRE, "Inspiring Space: CBRE's Journey to a New Way of Working," 2015 edition 2, www.cbre.us/o/sacramento/AssetLibrary/CBRE_inspiringSpace.pdf

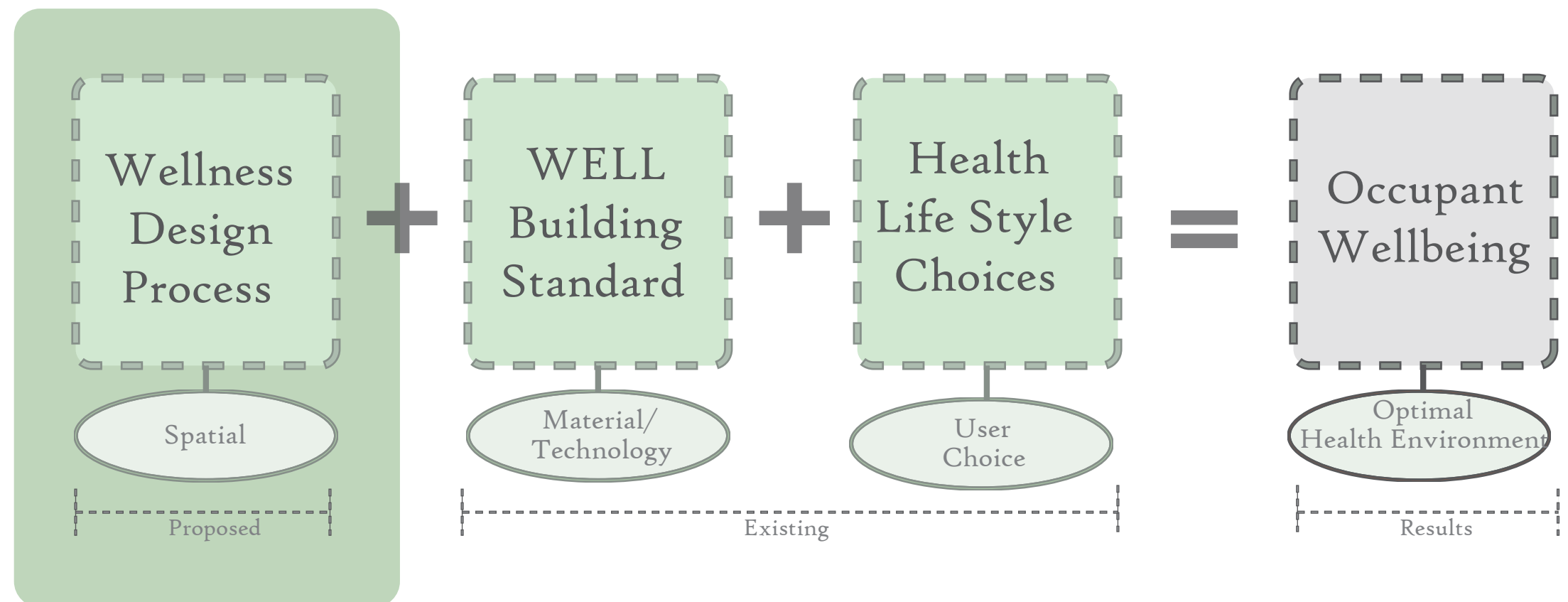
Conceptual Framework

This proposal seeks to align itself with the WELL Building Standards developed by Delos as a schematic design process. This proposal will act as a precursor to the WELL evaluation. The proposed process of design is intended to act as a guide offering a structural framework on which architects interested in well-building can utilize and build off of.

Social, emotional, and physical health (well-being) must be placed at the front of the design process. By carefully analyzing the physical, social, and emotional needs of the occupant specific to the demographic region in question an architect can uncover spatial solutions that may alleviate regional health concerns. As such, architectural endeavors to create an environment that promotes health should utilize targeted demographic research, climatic analysis and human-centric spatial studies in order to promote well-being.

The proposed method encourages innovative and traditional spatial solutions supported by technological solutions. Space making is considered the primary means of promoting health through, form, program, organization, internal and urban program relationships, and orientation. By making healthy lifestyle choices easier, more convenient, and visually interesting, occupants are more likely to take advantage of health opportunities. By designing a process of design, these relationships can be embedded in the architecture more completely than if one were to conform solely to the WELL building standards.

Ideology Behind Where Wellness Begins



This project seeks to propose a wellness design process during the schematic design process emphasizing spatial solutions

Design Approach:

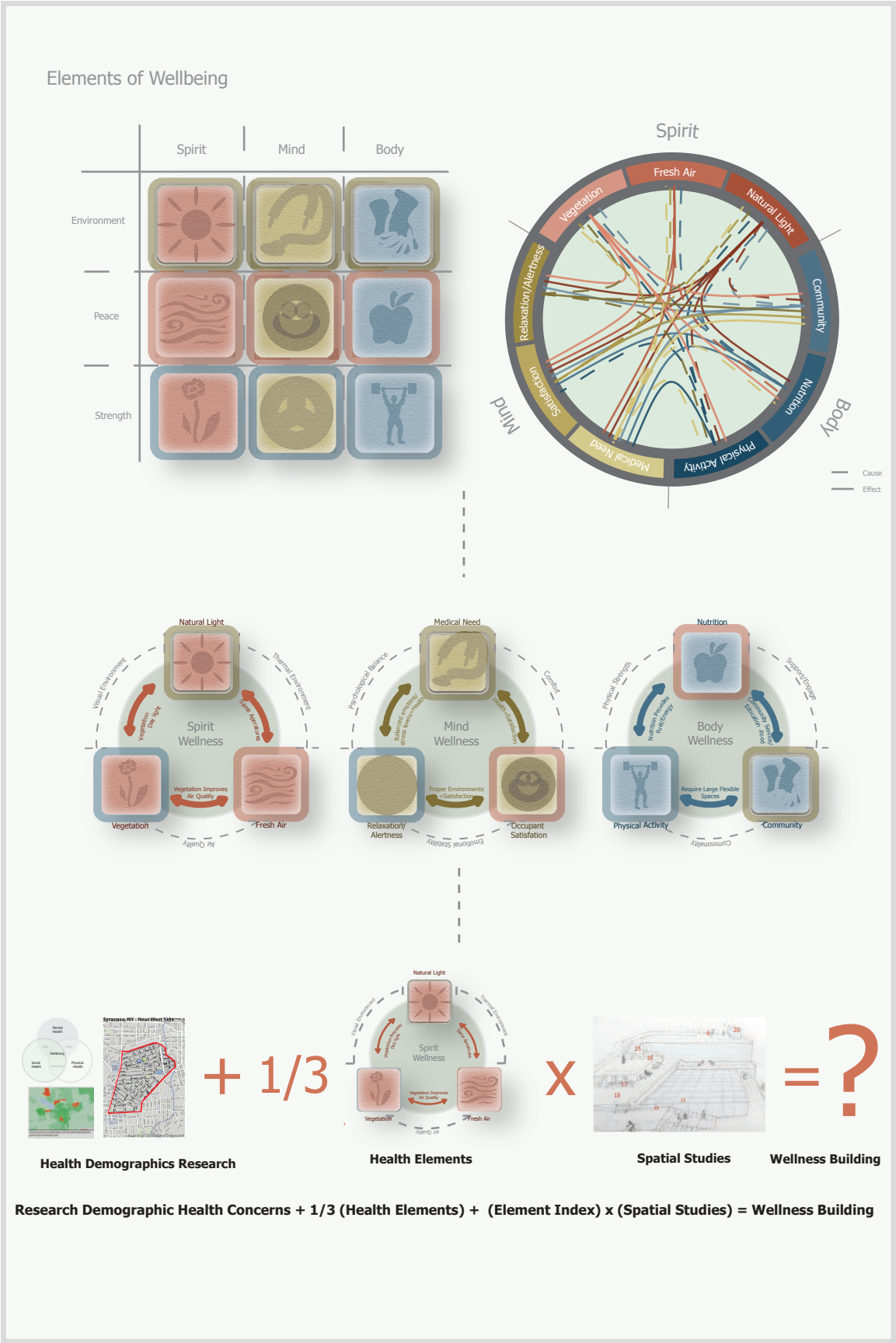
This project will attempt to suggest a design process for schematic design that will promote healthy environments and life styles based on social, physical, mental elements of health.

This project will define a set of nine elements that promote health in the above mentioned categories of health and provide a set of parameters, principles and design features that promote each element.

These elements can be utilized to address specific demographic health concerns by selecting the elements that are most lacking in the region and utilizing these elements to construct human-centric studies. The proposed process of design is not meant to be restrictive or finite but rather a fluid system of design that can be adapted by the firm and revisited at various stages of the design process.

This approach relies on a human-centric understandings of the built environment. This is to say, that this design approach attempts to understand and utilize the manner in which a person perceives space and the manner in which the space directly influences the occupants health.

Design Approach



Contention

This thesis contends that if occupant health is placed at the forefront of design, utilizing a proposed process of design that selects and addresses three out of nine suggested elements of health through demographic mapping and utilizes these elements to construct human-centric drawings during the initial stages of design, the resulting architecture will promote occupant wellbeing.

Defining Wellness

In order to start implementing healthy design decisions early in the process of design, it is important to understand what components of one's lifestyle and architecture contribute to health. The current understanding of well buildings varies across design professions and academics. Wellness can be defined as physical, social, emotional/mental, economic, political, urban, and even by standards of comfort. For the purposes of this examination, wellness is broken down into three critical categories that promote a healthy lifestyle : Physical, Social, and Mental Health. These categories were then broken down into nine elements.



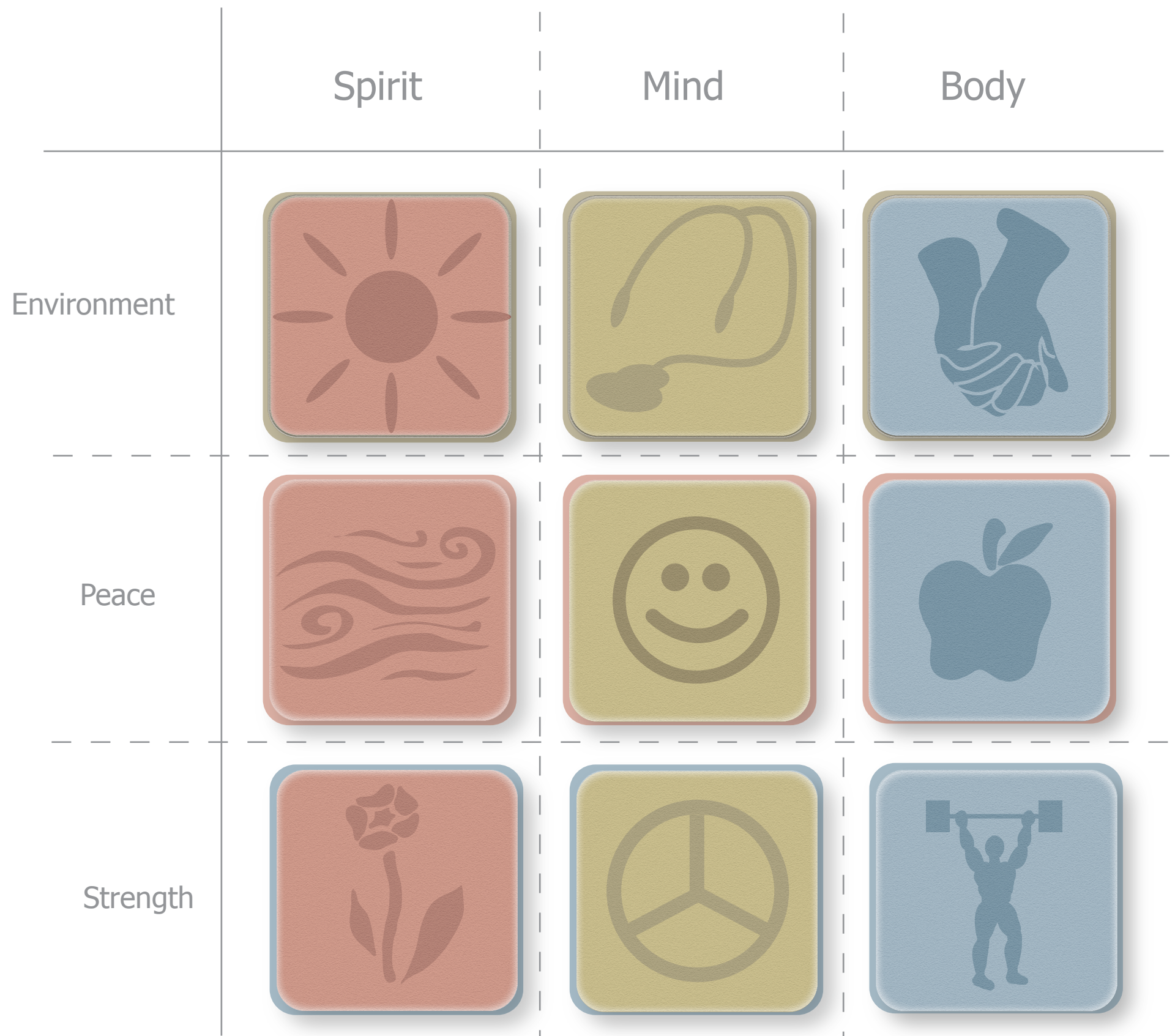
Health Parameters - This project will focus on the development of nine conditions that promote physical, social, and mental health. The ven diagram demonstrates the interrelation of the three categories used to define wellbeing. Each icon is representative of a trait/feature associated with health/wellbeing

The nine selected conditions/elements of health takes into consideration the seven conditions utilized in the 2012 Well Building Standards founded by Delos; air, comfort, fitness, light, mind, nourishment, and water. These seven were then re-prioritized in relation to the three categories of health (social, physical, and mental) seen in the ven diagram. Elements that existed in more than one category were seen as critical elements and utilized to define the nine elements addressed in this project. These elements will be utilized as a guide with design principles, spatial implications, and elements associated with each. Which elements are utilized and in what manner should be determined by health demographics, building type, and climatic conditions. These conditions are applicable to all building types and locations, new construction and rehabilitation with a particular emphasis on urban environments.

9 Elemental Conditions of Health Promoting Designs:

- 1 - Daylight
- 2 - Fresh Air
- 3 - Physical Activity
- 4 - Nutrition
- 5 - Vegetation
- 6 - Community
- 7 - Relaxation/Alertness
- 8 - Occupant Satisfaction
- 9 - Demographic Medical Needs

Elements Of Wellbeing



Interconnection of Elements And Element Groups:

The nine elements proposed are conceived as interconnected element in which the effects of many elements, the health objective, and the means of obtaining each element overlap creating a design web. By mapping the similarities and overlaps between the various elements, the nine categories can be conceived of a three interrelated groups representing mind, body, and spirit

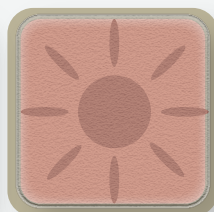
Spirit



Vegetation



Fresh Air



Natural Light

Mind



Medical Need



Occupant Satisfaction



Relaxation/Alertness

Body



Community

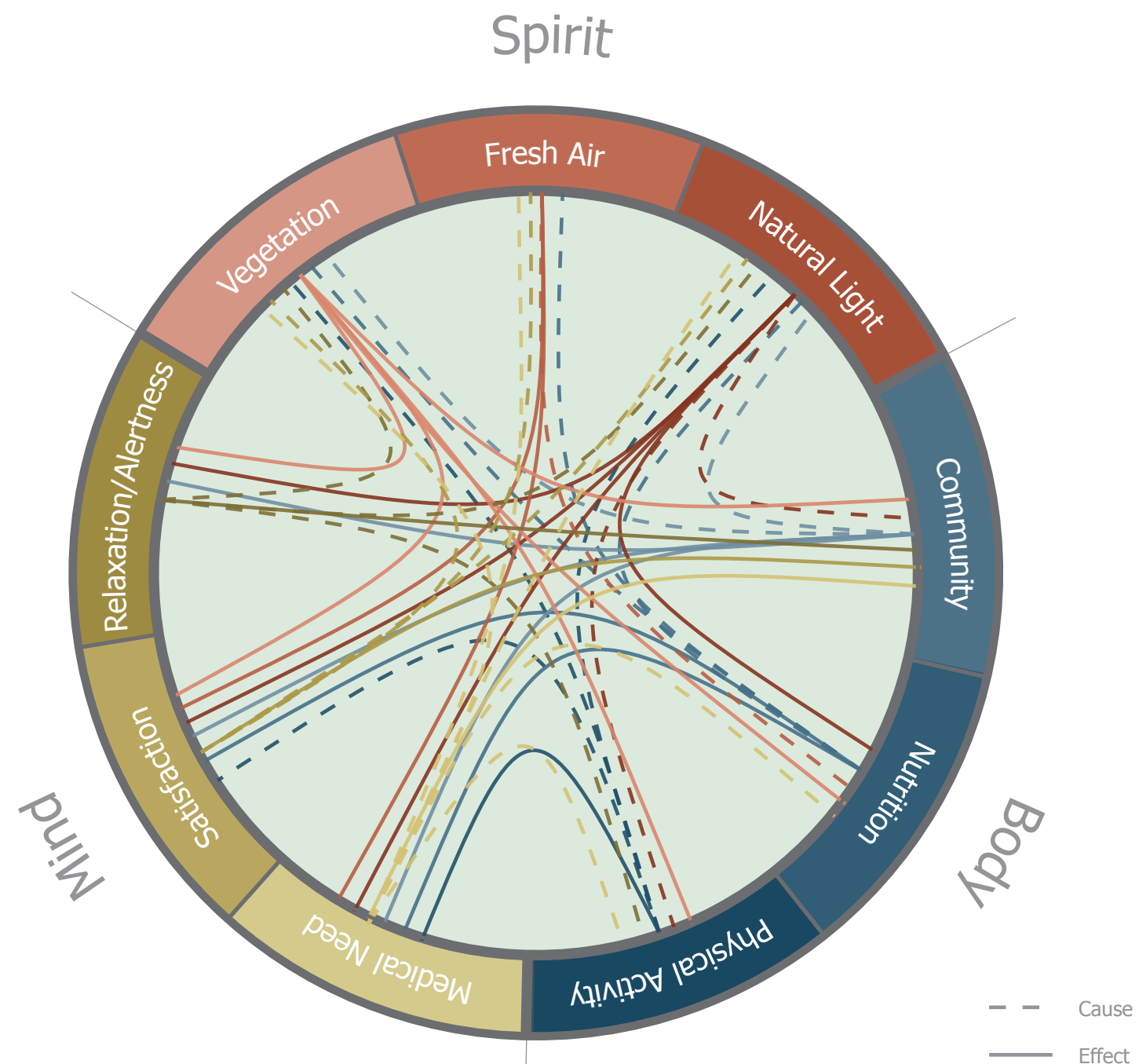


Nutrition



Physical Activity

Interrelation Of Wellbeing Elements



For ease of use, the elements were broken down into three sets of inter-related groups that build off of each other and offer opportunities for integrated design ideas.

Spirit

Fresh Air - Fresh air is often delivered through perforated walls, windows, doors and outdoor spaces that must also mitigate lighting effectively. Fresh air also is provided by vegetation found in green spaces.

Daylight - Day lighting apertures also offer possibilities for fresh air and is required for the growth of vegetation/green spaces

Green Spaces - Green spaces require day lighting and produce fresh air. Green spaces are often used in exterior environments or are in close juxtaposition to outdoor environments that must properly mitigate the availability of air and lighting concurrently with greenery.

Mind

Medical Need - Medical needs must be satisfied for occupants to be satisfied and appropriately alert to manage the days functions

Occupant Satisfaction- Occupants must feel safe, healthy and able to enjoy their activities in order to be satisfied. If unsatisfied, relaxation may not be possible.

Relaxation/Alertness -Adequate levels of alertness are derived from chemical/hormonal balances (medical needs) and adequately planned spaces (satisfactory environments). It is also required for satisfaction

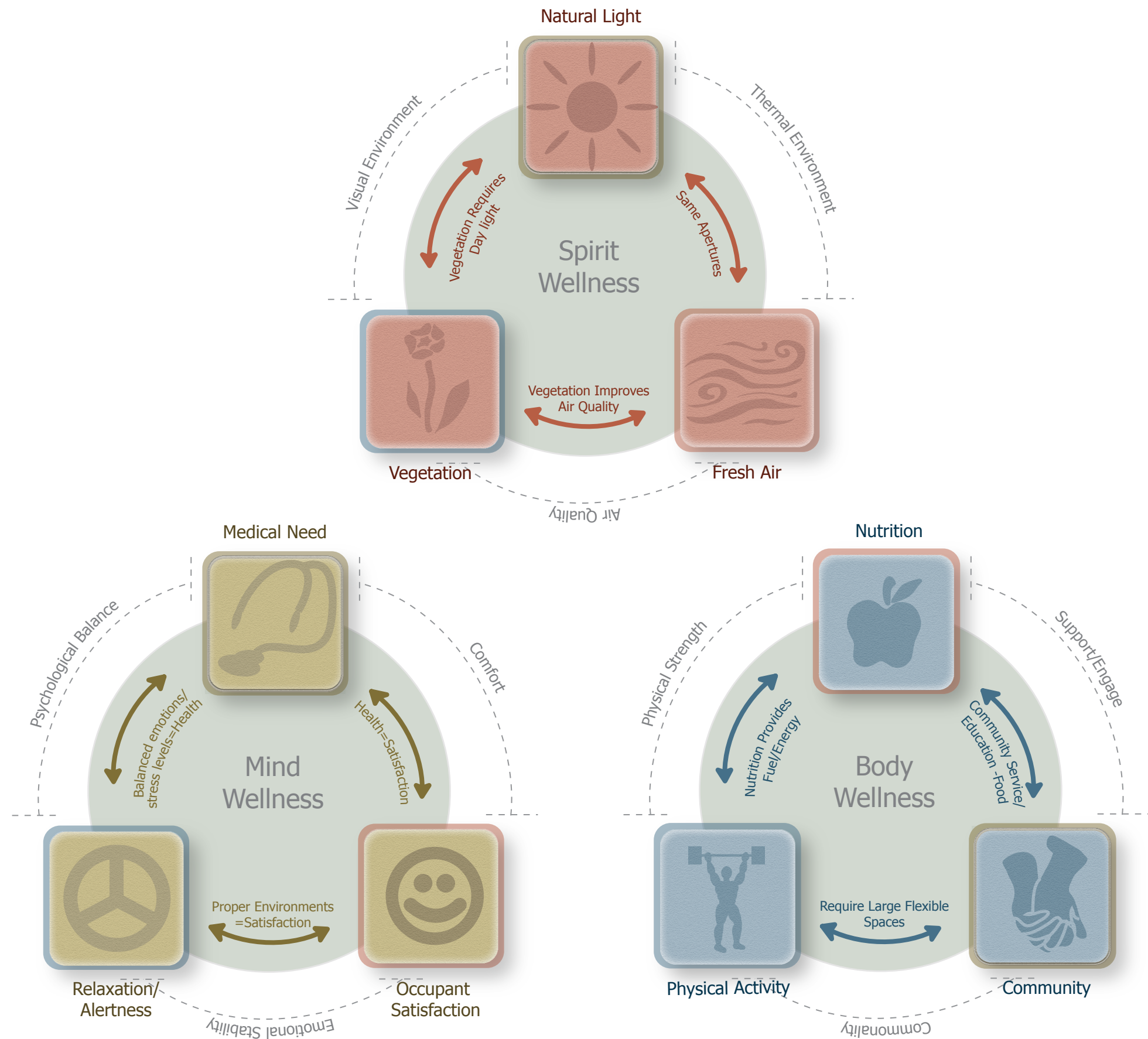
Body

Physical Activity - Nutrition provides the necessary energy that is used to power physical activity. Physical activity fosters community unity through the use of group workouts (i.e. yoga, spinning classes, walking clubs), communities hold each other responsible for activity, and community space offer places for physical activity to occur

Nutrition - Communities can provide food for those struggling to afford nutritious food through food pantries and can also aid in the production of nutrition in the form of community gardens and cooing groups. Nutrition then supplies people with energy and health to preform physical activity and participate in community endeavors.

Community - In order to function within a community one must be physically fit. This can be achieved through exercise and nutritious diets. Cooking courses, recipe swaps, exercise classes also build community. Conversely, community spaces and groups provide the spaces and means for exercise and food sourcing.

Element Sub Categories



Design Process



Research Demographic Health Concerns - Health Elements - Spatial Studies - Wellness Building

The process is both linear and cyclical as one goes through the motions, there can be a lot of back and forth; testing and retesting

Part One:

Demographic Health Concerns

Demographic Health Concerns

Health Demographics - What to Map?:

Physical Elements:

Health Problems - obesity, diabetes, asthma...

Mortality Rate
Pedestrian Safety
Food Sources
Fresh Water Supply
Parks
Promenades
Gyms
Climatic Conditions

Social Elements:

Community Centers
Restaurants, Shopping Centers
Theaters, Recreation
Urban Circulation
Plazas
School Systems

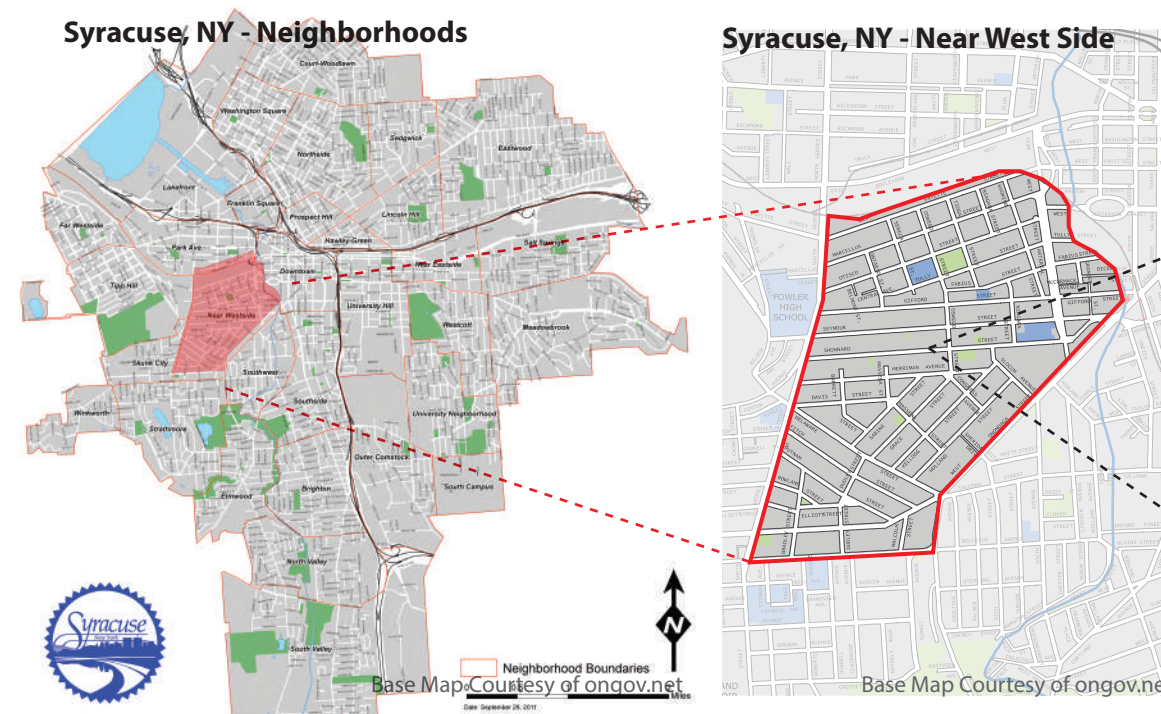
Mental Elements:

Volunteer Organizations
Community Support Groups
Public Spaces

Demographic Analysis Method:

Mapping - analytical - primary means to understanding the spatial implications of the communities wellbeing

Statistics - Charts - Figures and percentages should be represented graphically in labeled pie charts and graphs.



Infant Mortality Rates

Locality	Infant deaths per 1,000 live births
Onondaga County	5.5
White	4.3
Black	12.4
Hispanic	8.3
Syracuse	6.7
White	4.6
Black	11.5
Hispanic	7.8

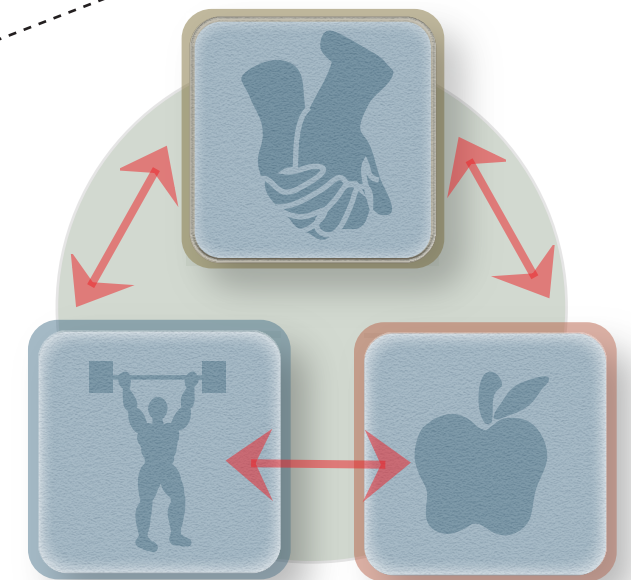
Source: Statewide Perinatal Data System, OCHD Bureau of Surveillance and Statistics
*2011 and 2012 data are provisional



Community Commons 2.0 Starter Map, Community Health Needs Assessment
USDA Food Environment Atlas, 2010

Body

Physical Elements



Health Demographics - Health demographics focuses on the mapping of community information to understand what the social and physical health concerns of the area are, how the environment may be negatively impacting by these health concerns and how they can be mitigated using design.

Use of Demographic Mapping:

The value of analyzing health demographics within a region lies within the designers ability to gear architectural methods of form, organization, and health principles specifically to the needs of the occupants that will be utilizing the construct. This allows the building to have a greater impact on the wellbeing of the occupants and the community at large.

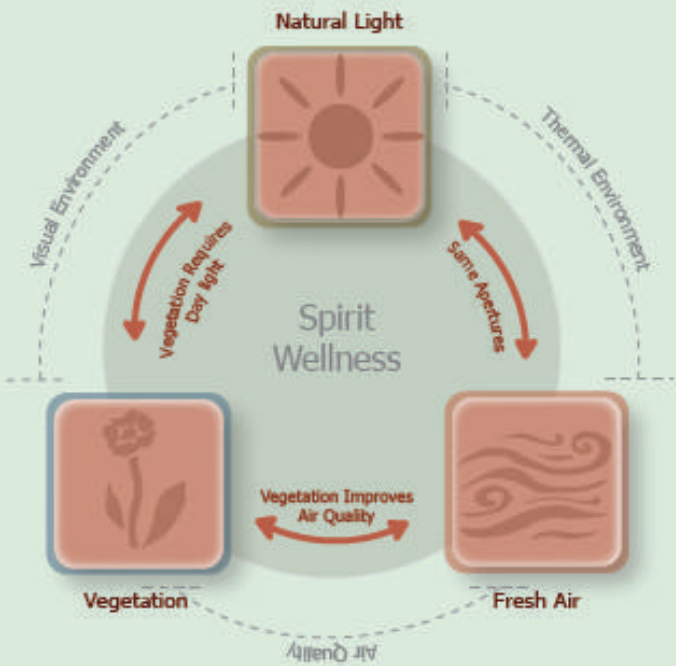
This is considered the first stage of the design process. At the completion of this stage, designers should know which three elements of wellbeing must be focused on during the design of the construct to best mediate apparent regional health concerns.

Part Two:

Element Selection And Interrelation

Element Selection:

Select the elements best fit for the site and program



Vegetation

Vegetation - Vegetation produces oxygen, improving air quality and moisture levels. Vegetation can be used for growth of nutritious produce and can provide recreation and exercise if utilized as a community garden. Vegetation also seeks to invite the community to gather and relax.

Fresh Air

Fresh Air - Fresh air is critical to occupant health and comfort. Proper ventilation and air quality improve occupant alertness, physical wellbeing, and thermal comfort. Fresh Air promotes satisfaction and is necessary for community and physical activities to take place.

Natural Light

Natural Light - Visual and non-visual daylighting can promote physical wellbeing and comfort. Adequate light levels provide visual comfort and color rendering. Daylighting also provides indirect comforts and health benefits through the promotion of the circadian cycle, thermal comfort, digestive cues, vitamin D production, and general satisfaction.

Reference the guide information relative to the selected elements

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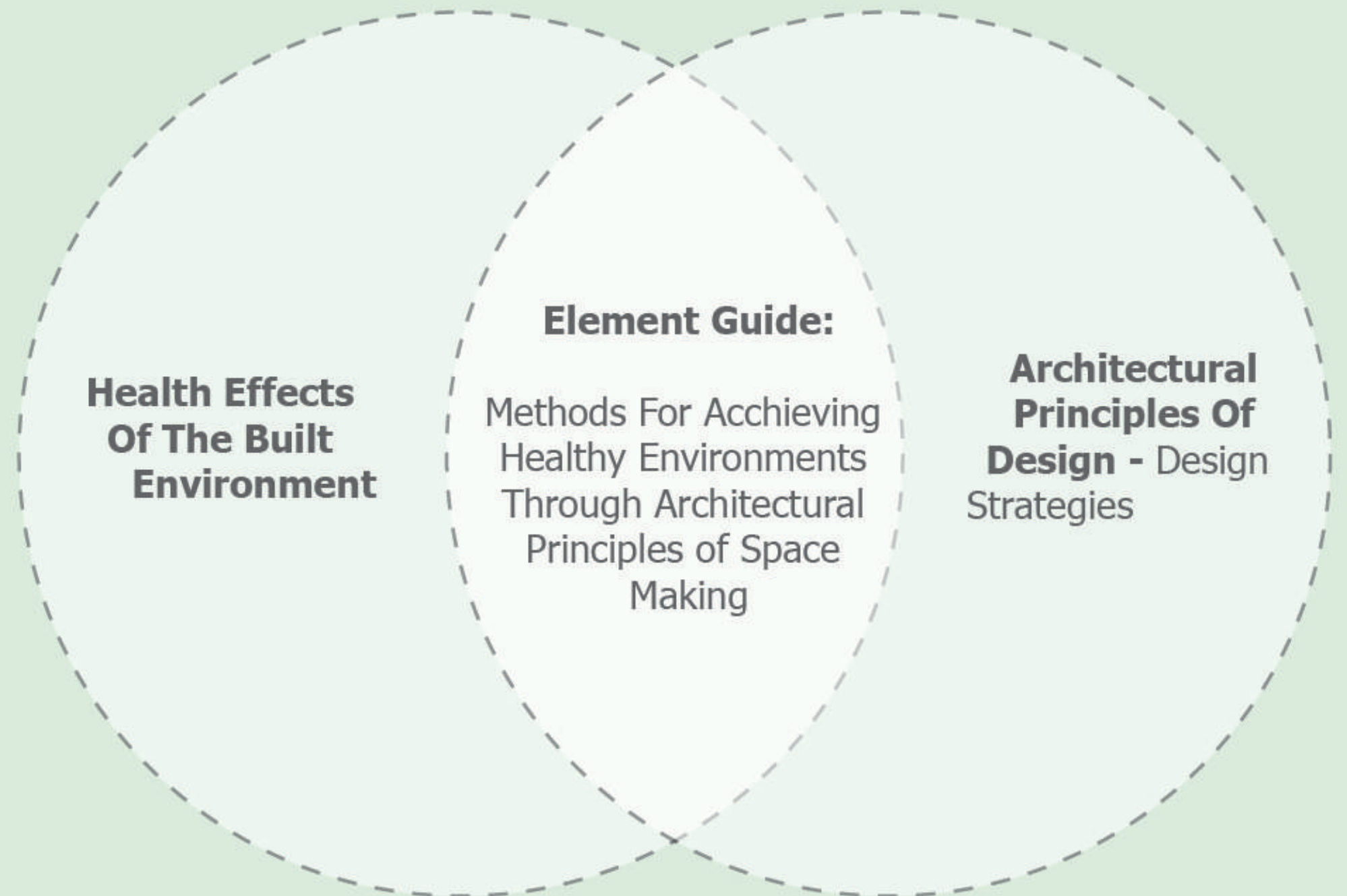
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[illegible]

Understanding The Guide

Each element is associated with a set of design principals that express the relation between medical health and architectural principals. The overlap of these two concepts can be used to construct spaces that meet the requirements of medical benefits. For example, UV-B light has the ability to produce vitamin D when it contacts human skin.¹ UV-B light is only available from the sun when it is at an altitude of 50 degrees or more. As such, a top-lit courtyard may be constructed in order to provide occupants with the opportunity to get some vitamin D. This may be a midday eating space as the sun is at its highest during mid day and would thus provide the most UV-B rays at this time.



Part Three:

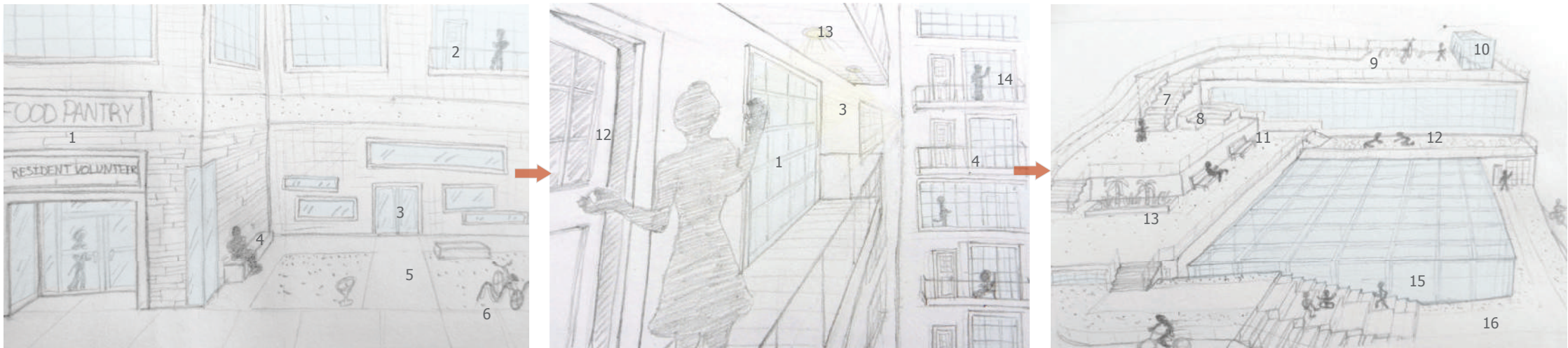
Human-Centric Design Testing

The Idea Behind Human-Centric Studies:

Human-Centric Studies - Visual studies that begin to map out designs utilizing the human perspective. This thesis argues that buildings should be designed to promote wellbeing/health spatially. This suggest that the designs must take into consideration the view and experience of the occupant. Human- Centric drawings are a method of ensuring this through annotated perspective, sectional and axonometric drawings that attempt to implement the nine elements of wellbeing.

Spatial studies or vignette are opportunities for designers to test various architectural components in juxtaposition with each other. The elements and configurations of each image should reflect the three elements of wellbeing selected during the research stage and specified in the element index. The utilization of perspectival views offers a sense of occupant comfort and suggests spatial solutions to wellness construction. These scenes can be annotated to specify specific technological and material desires. Each scene acts as a storyboard as in the film industry and can be rearranged to explore various building organizations and narrative sequences. These spatial studies are not finite products but diagrammatic design process (working) drawings. The perspectives should be revisited frequently to address changing notions or more complete designs.

Benefits of Human-Centric



14

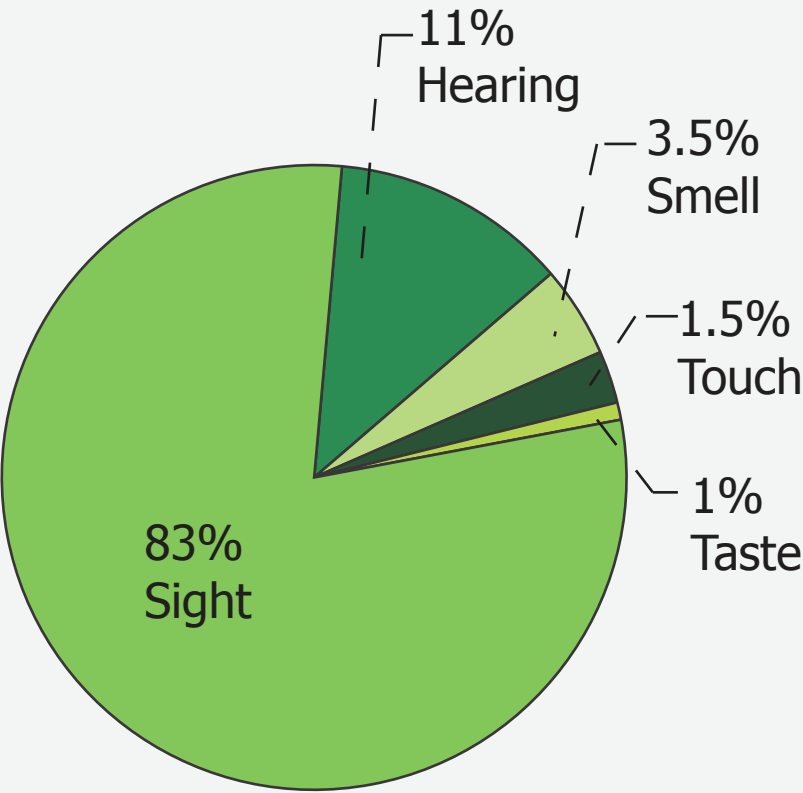
Spatial Studies - Visual narratives utilized to develop and test space making, juxtaposition, architectural principles, and architectural elements in the construction of environments that promote healthy life styles.

Human-Centric Visual Studies

Design Around The Nine Elements With An Emphasis On The Three Most Prevelent To The Site:



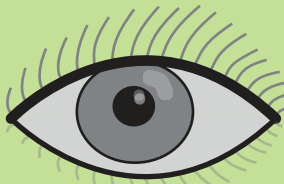
Information Processed From Each Sense At A Given Time:



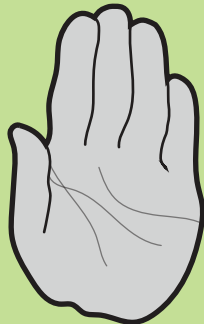
The senses in this chart reference the work of Dr. Rosenblum in relation to perception range.

Methods Of Production

Primary Senses For Human-Centric Designing



Sight - Vision



Touch - Feeling

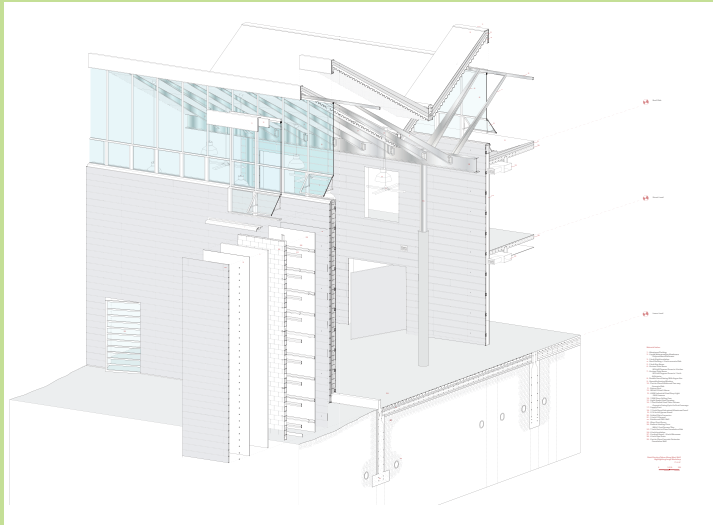


Hearing Auditory



Brain - Obscure Health Effects Of The Above

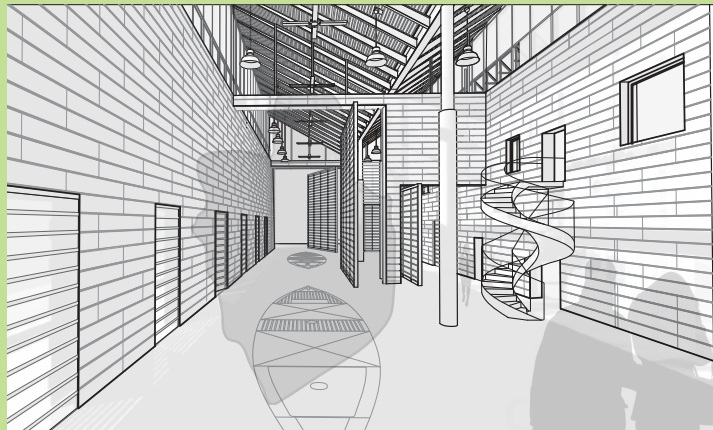
Drawing Types:



Axonometric



Sectional



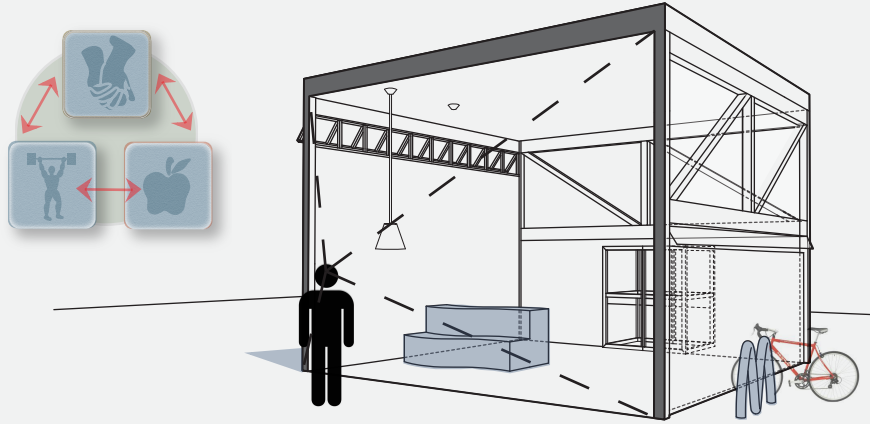
Perspectival

Human-Centric Visual Studies

Spirit Elements -
Medical Need, Relaxation, Occupant Satisfaction



Body Elements -
Physical Activity, Community, Nutrition



Mind Elements -
Vegetation, Daylight, Ventilation



Application Of Design Elements in Human-Centric Drawings



- Element Incorporation Key:
- 1 -Vegetation - Green Space For Fresh Air, Community, Nutrition, Occupant Satisfaction and Health
 - 2 - Natural Ventilation - Fresh Air for Health, Occupant Satisfaction, Alertness and Community
 - 3 - Daylight - Vissual and Non-Visual Daylight For Occupant Satisfaction, Health, Alertness, Community
 - 4 - Lighting Zones - Promote Gathering For Community/Security For Relaxation and Satisfaction
 - 5 - Entrance - Clear Public, Welcoming Entrance For Community and Occupant Satisfaction
 - 6 - Seating - Promote Gathering For Community and Occupant Satisfaction
 - 7 - Bike Rack- Exercise For Physical Activity and Community

Focus - Daylighting Element Analysis

Daylighting is a crucial element of wellbeing. While all nine elements described in this document are considered interconnected, Natural Light - Daylight is relevant to each and every element to varying degrees.

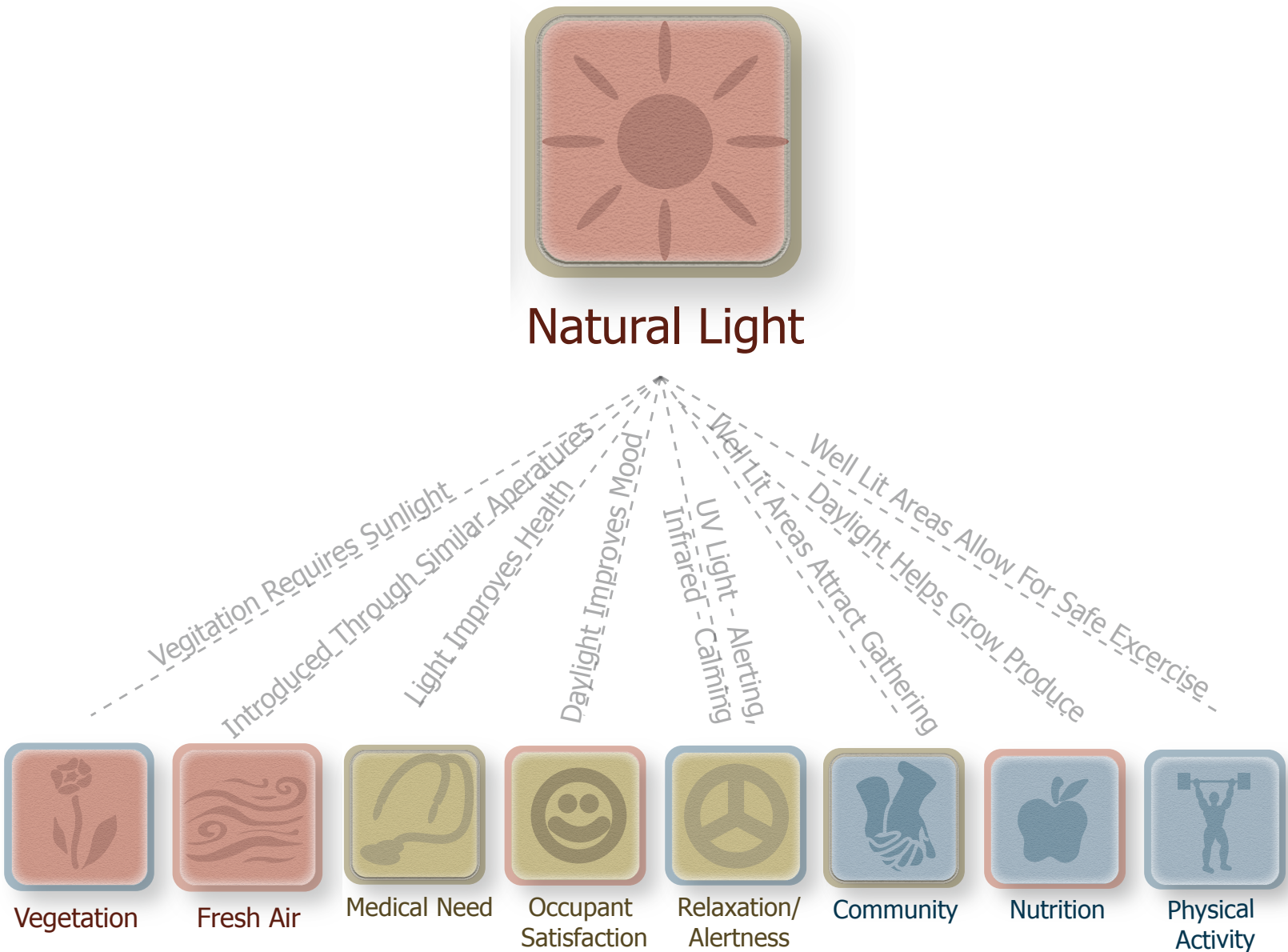
Within the sub-group spirit, Natural light is required for the growth of vegetation. Simultaneously, natural light and ventilation share similar apertures and are used to regulate adequate temperatures within a building.

The mind sub-group of elements: medical need, occupant satisfaction, and relaxation/alertness also interact with daylighting. Daylight provides medical benefits to the regulation of digestion, sleep-wake cycles, hormonal balance, and vitamin D production.¹ Natural light can also create a pleasant environment for occupants resulting in occupant satisfaction. Additionally, blue ultraviolet light from the sun can improve daytime alertness, and the mitigation of sunlight can be calming in the evening.

In relation to the physical sub-group, daylight has the ability to draw communities together. Well lit areas are safe, comfortable, and productive environments that attract gatherings. Well lit spaces also provide higher levels of alertness that allow occupants to feel energized and have a safe environment in which to exercise. Natural daylight is also required for the growth of produce that can add to a nutritious lifestyle

How Daylighting Effects Health

Interrelation Of The Nine Elements



1 - John Stanislav Sladar, "Beyond Blue: The Non-Visual Effects of Light and Colour in Architecture," Architecture Theory Review 19.2 (2014): 176-178.

Visual and Non-Visual Effects Of Daylighting

Visual - Visual components have a direct impact on the manner in which an occupant perceives the environment. Light levels, quality, coloration, and strain are all concerns of the visual effects of daylighting. The visual cortex is responsible for interpreting the information provided to by the cones and rods in the eye in order to understand these elements.

Non- Visual - The non-visual refers to the effects daylight has on the occupant that do not pertain to perception. These components include the effects of daylighting on circadian rhythm, hormone production, vitamin d production, comfort, psyche, and thermal comfort



Natural Light

Visual

Beauty
Light Availability
Color Rendering

Non-Visual

Circadian Cycle
Hormone Production
Vitamin D
Therapy
Thermal

Biological Effects Of Daylighting On The Brain

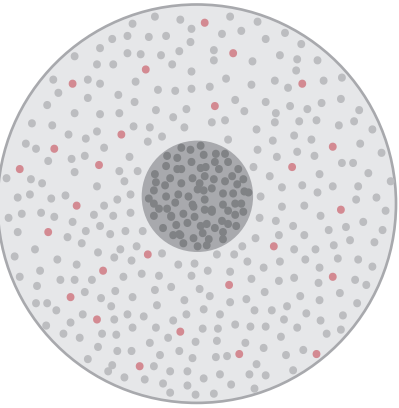
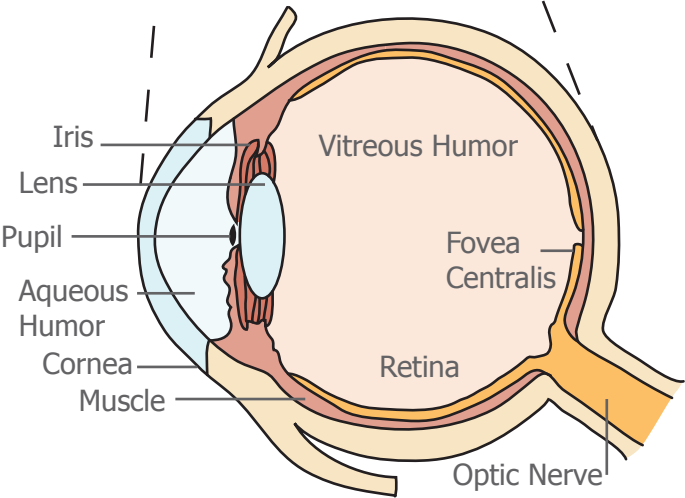
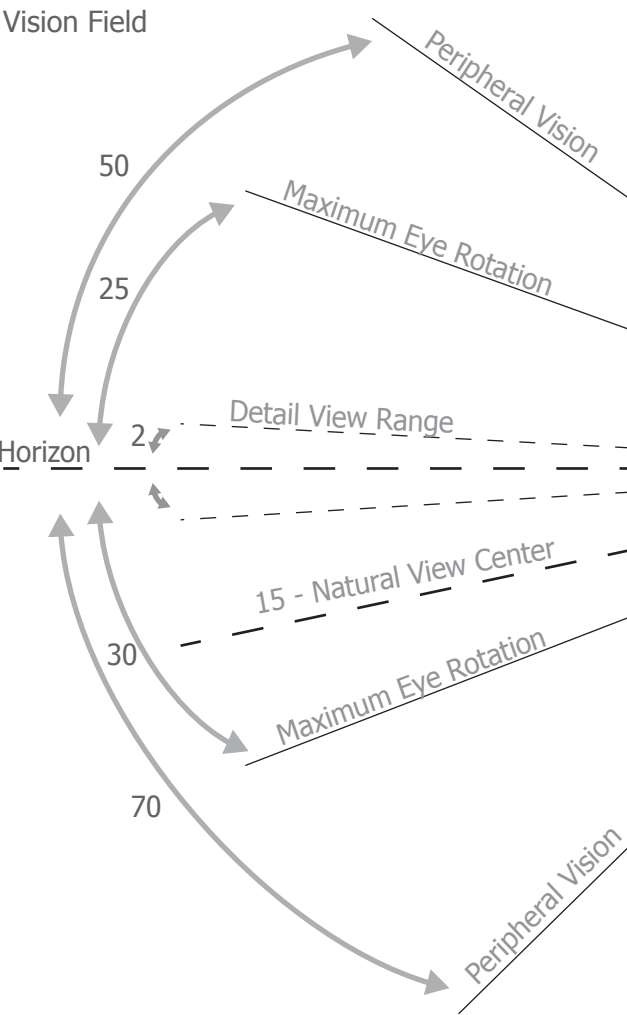
Understanding The Effects of Light:

Suprachiasmatic Nucleus (SCN) - Non Visual:

The Suprachiasmatic Nucleus (SCN) regulates the bodies circadian/endocrine cycle. Ganglion cells scattered along the retina detect various levels of light signaling the scn. These light detections keep the scn cells in time with each other regulating the sleep-wake cycle of the body through hormone production (melatonin and corticoids). This system regulates eating, circulatory and digestive cycles.

Visual Cortex - Visual:

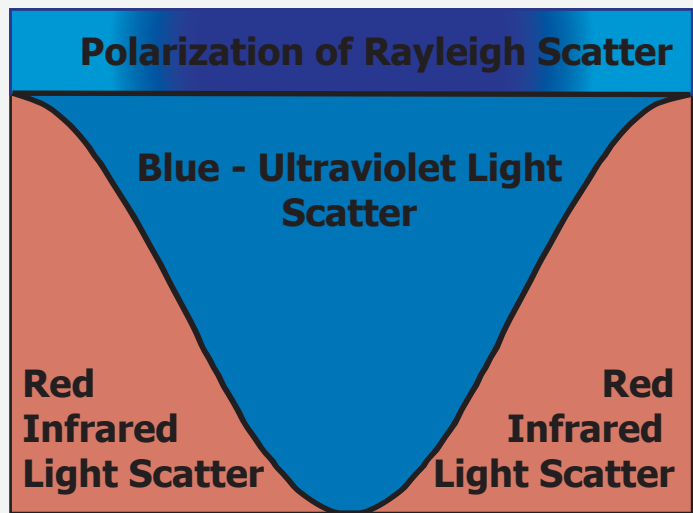
The Visual Cortex is responsible for processing visual information provided by the cones and rods of the eye. Cones interpret wavelengths of the visible spectrum into colors - red, blue, and green. Rods detect light levels to interpret images. Rods are used for low light levels with slow adaptation to illuminance level changes and lacks color sensitivity. This is the region of the brain that allows one to see the visual world



- Retina
- Rods - light sensitive - no color recognition - 120 million rods
- Fovea Centralis - Patch of rod free cells - houses most cone cells
- Cones - Light sensitive - three colors red, green, blue - 6-7 million
- Ganglion Cells - light sensitive - 1.2-1.5 million cells

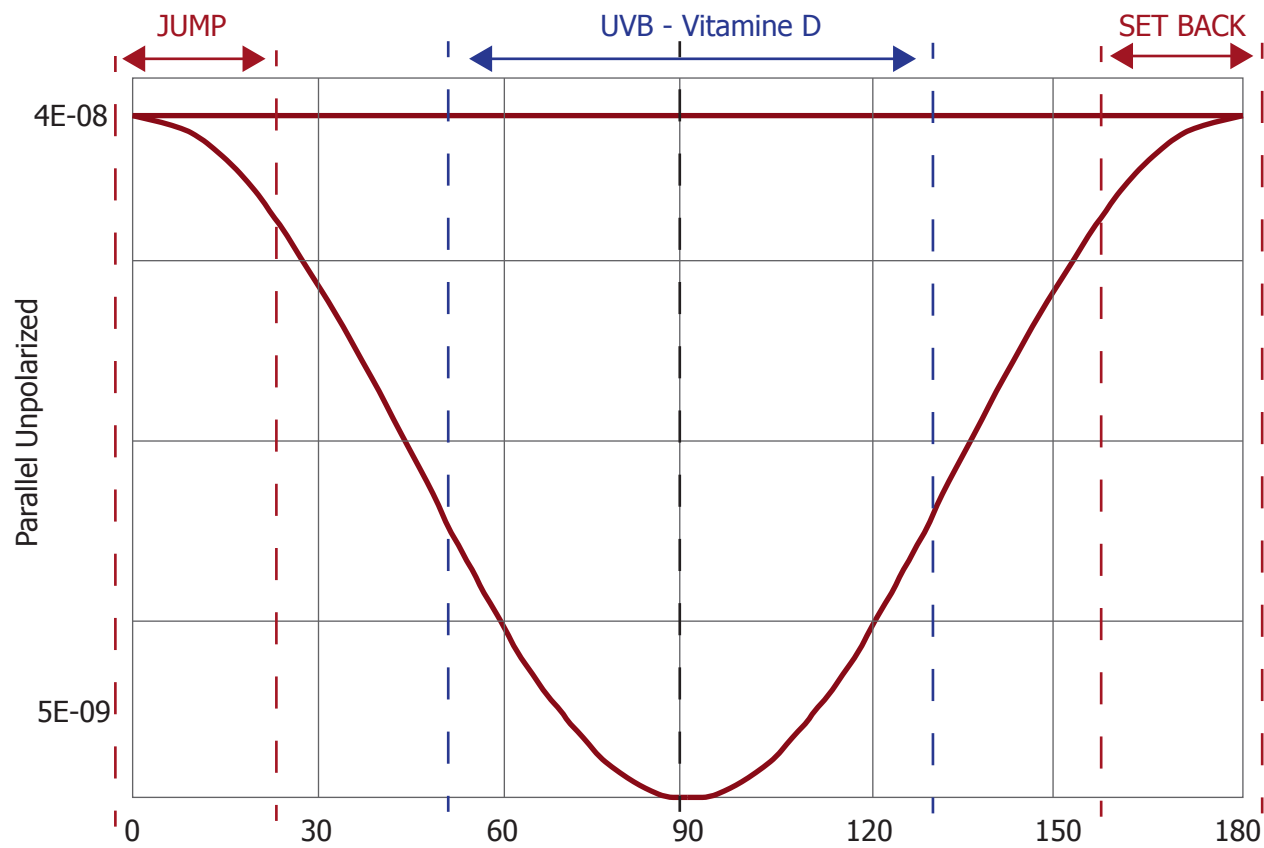
Visual & Non-Visual Effects Of Day Lighting

The sun’s altitude has a profound impact on the type, quality and quantity of light that reaches the earths surface. Appart from influencing orientation and planning, this information can be useful in understanding how exposure to these types of light may effect the body. This creates an overlap between the scientific understanding of light, medical impacts of light and architec-tural principles available to mitigate the effects of daylight on the body. Daylight has the ability to provide immune support, vita-min D production, regulated body tempera-ture, stimulated metabolism, improved circulation, circadian rhythm/melatonin production.¹ It is important to note however that diferent exposures provide different benifits. For example, Ultraviolet UV-B light aids in the production of vitamin D but only when the suns altitude is greater than 50 degrees. Thus, an outdoor space that pro-vides only direct sun from 50 degrees or greater altitude conditions would provide users with the most optimal lighting condi-tions for vitamine d production.



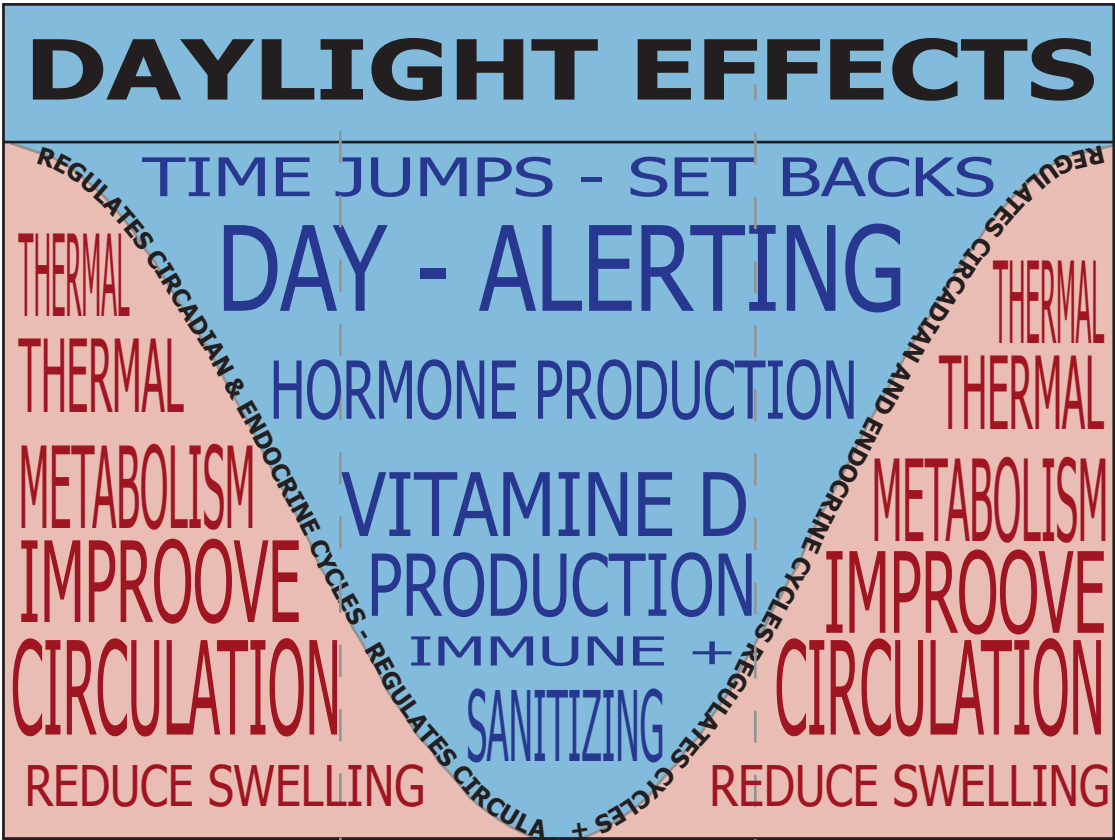
For Sonstant Illumanance Levels

Rayleigh Scatter Calculations:



Scattering Angle - Altitude For Solar Rays on Small Particles (.01 um)
Graph base curve courtesy of <http://www.philiplaven.com/p8b.html>

Health Imlications:

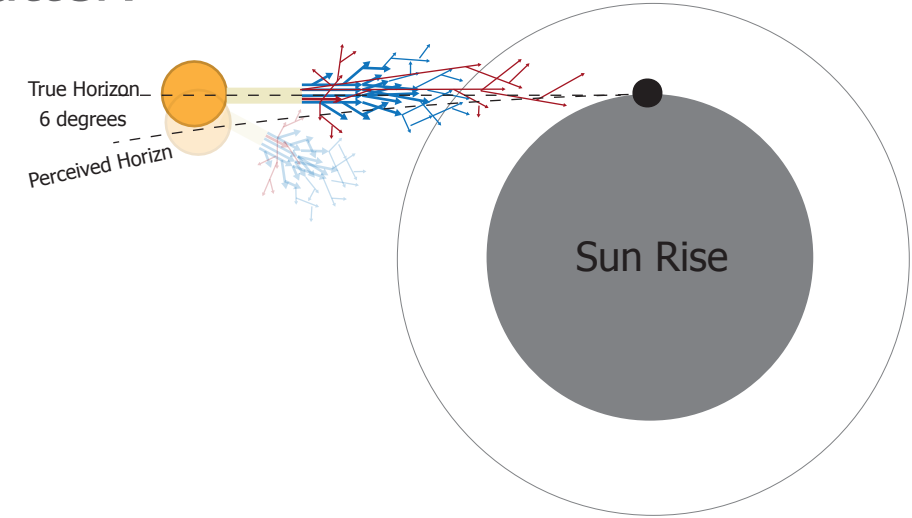


1 - John Stanislav Sladar, "Beyond Blue: The Non-Visual Effects of Light and Colour in Architecture," Architecture Theory Review 19.2 (2014): 176-178.

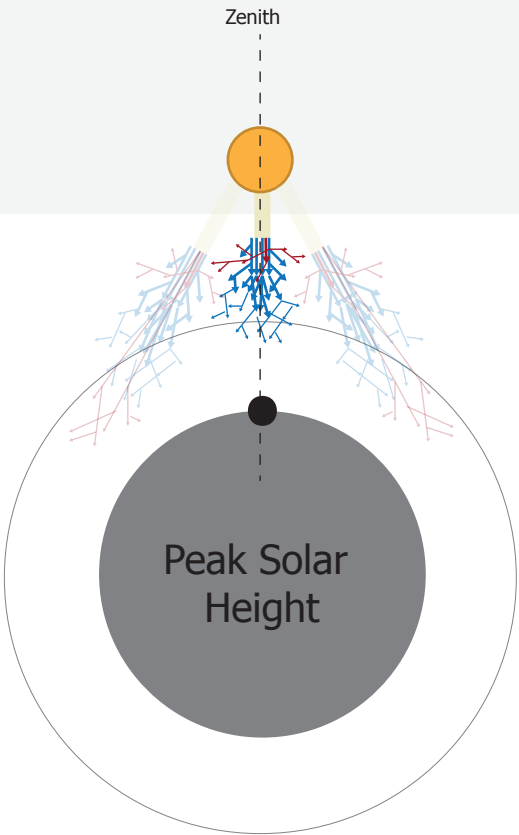
Visual & Non-Visual Effects Of Day Lighting

Light Type Availability - Rayleigh Scatter:

Medical effects of daylighting revolve around exposure to the appropriate daylight radiations. As such, understanding the availability of infrared radiation in the morning and ultraviolet radiation in the evening can aid in planning, orientation, and program allocation.



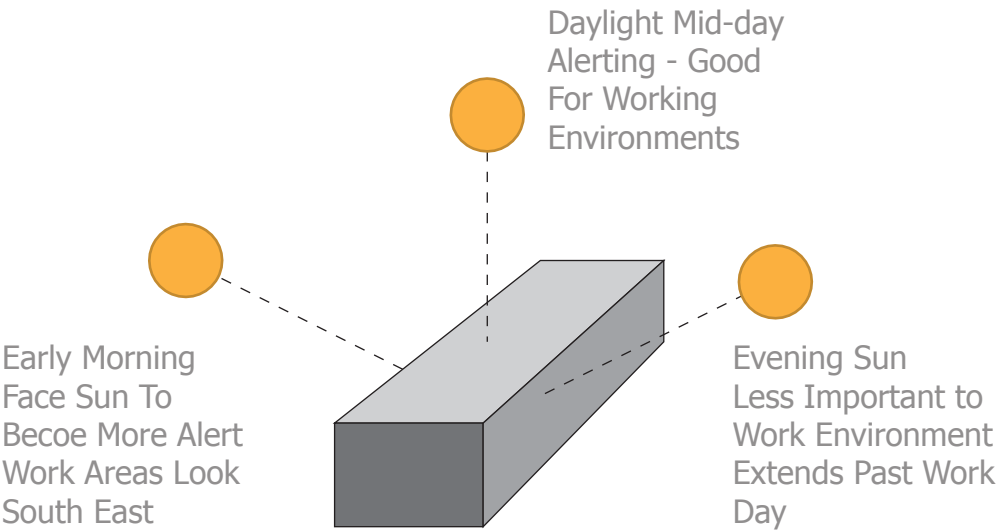
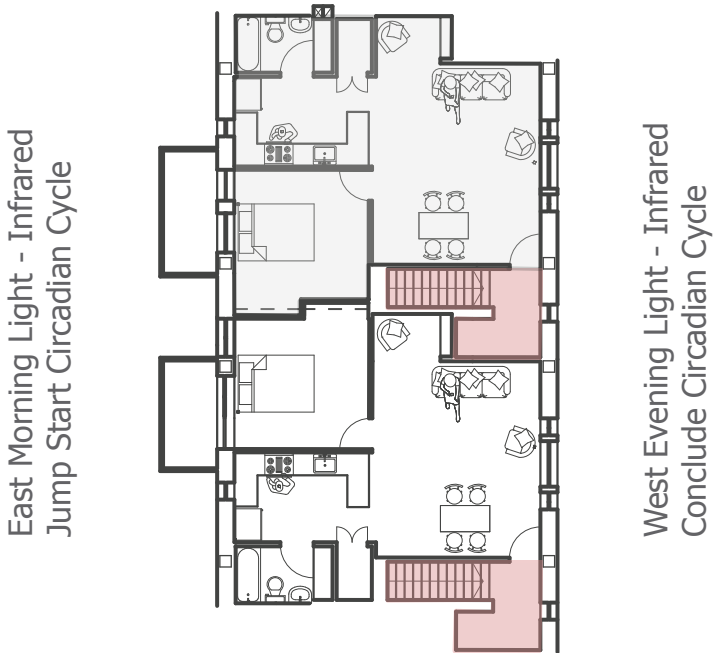
Infrared Red Light
Travels Farther Through The Atmospher Than Blue Light
Weaker light - Less Energy



Ultraviolt Blue Light
Blue Light Scatters At 10x The Rate Of Red Light
Strong Light - High Energy

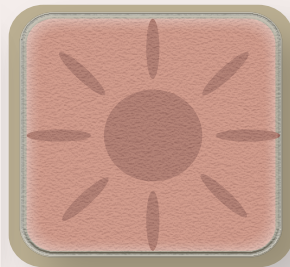
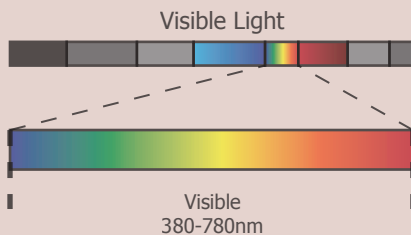
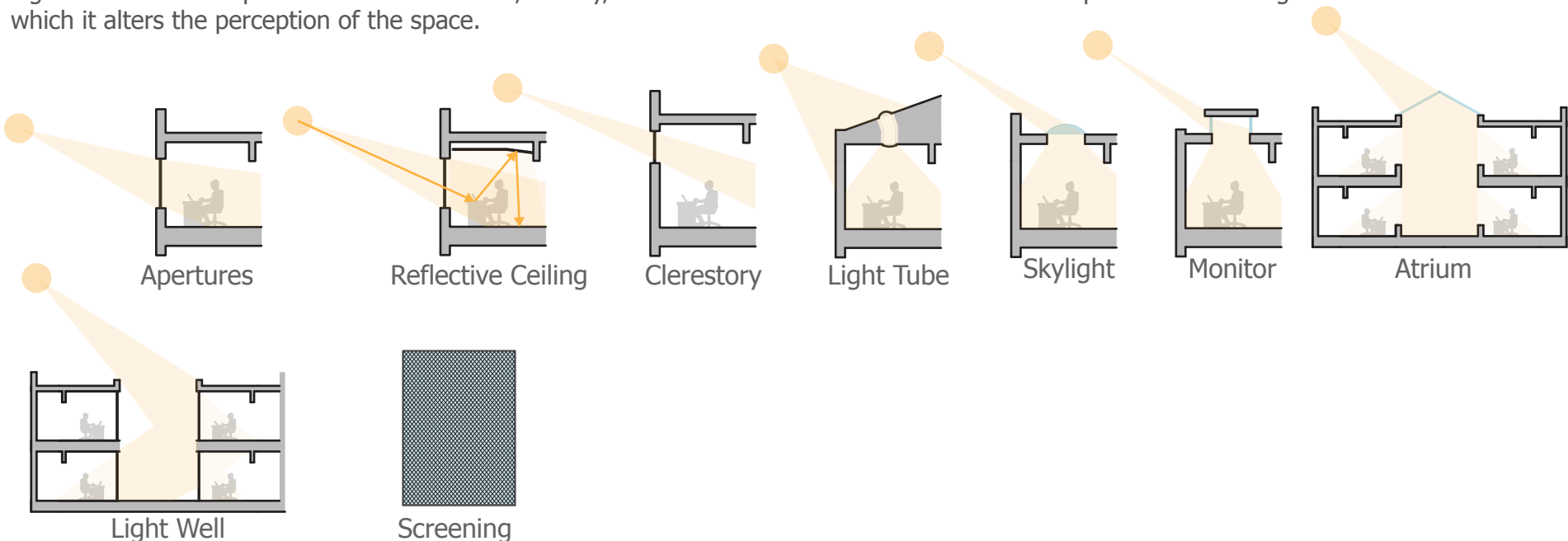
Application - Programing and Orientation:

Provide adequate lighting at the appropriate time of day understanding what type of light is available and its subsequent health benifits



Office Building -Northern Hemispher - Ideas

Daylight Guide

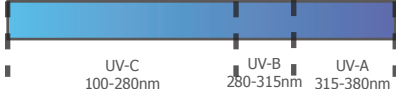
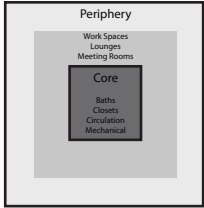
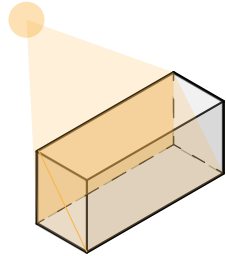
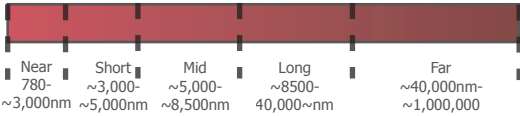
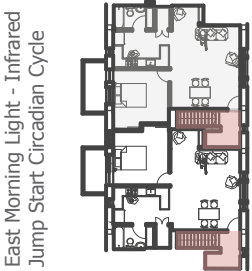
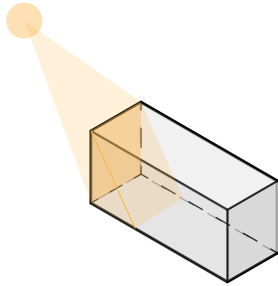
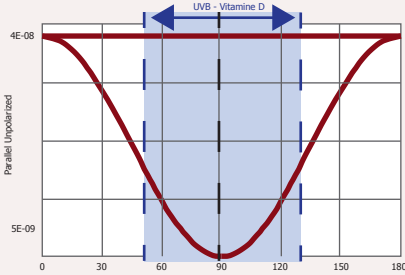
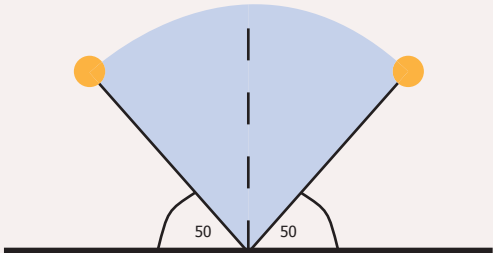
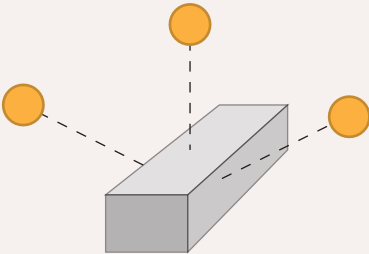
Spirit Elements		Natural Daylight	
Visual Non-Visual			
<div><p>Natural Light</p></div>	<p>Key Terms:</p> <div><div>Visual</div><div>Non-Visual</div><div>- Beauty, Visual Comfort, Coloration</div><div>- Circadian Rhythm, Hormonal Balance, Vitamine D Production, Light Therapy, Thermal Comfort, Vegetation</div></div>		
	<p>Considerations:</p> <div>-surface, Material, Color, Glare, Availability, Time, Task, Exposure, Orientation, User Interface, Program Organization, Temperature, Reflection</div>		
		<p>Element Brief:</p> <p>Natural Light refers to daylight as it pertains to the manner in which it interacts with the building and consequently the occupant. There are two primary components of daylight that have an effect on occupants; the visual and the non-visual. Both visual and non-visual light have the ability to effect the physical wellbeing of the occupants through health, alertness, and comfort/satisfaction. Day light is necessary for the production of vegetation, promote gathering, provide a safe setting for exercise, contribute to the growth of nutritious foods, effect mood, improve health, and effect alertness.</p>	
<div><p>Visual</p></div>	<p>Visual daylight refers to the spectrum of light emitted by the sun that is visible to the human eye: 380-780nm. This light is detected by the cones and rods of the eye and interpreted by the visual cortex. Visual light allows for perception and color understanding.</p>		
	<div><div>Beauty</div><div>Beauty refers to the role of light in occupant satisfaction. Light has the power to evoke emotional responses, inspire awe, and create an atmosphere. Beauty primarily aids in the occupant satisfaction and encouragement of community (places of gather)</div></div>		
		<div><div>Aesthetic</div><div><p>Light can be used to provide moments of awe, beauty, and reflection. This is often considered a spiritual effect of light and the manner in which it alters the perception of the space.</p></div></div>	
		<div><div>Material Surface</div><div><p>Material use and surface reflectance, transmittance, absorption, and emission can effect the atmosphere and use of the available light. Darker colors tend to absorb light providing less light for tasks but often provide warmth as in the use of dark woods. Reflective, light materials such as white paint bounce the light into the space giving it a larger,lighter, sterile appearance.</p></div></div>	

Visual Comfort		Light Availability refers to the use of light for visual performance. Light availability allows for general and task lighting that prevents visual strain, maintains a safe environment, and considers visual comfort through the avoidance of glare. This is a matter of physical wellbeing and most relates to medical need, occupant satisfaction, community gathering, and physical activity.
	Access	<p>Light availability is crucial for performance through the introduction of apertures and light filtration in reference to orientation, program, context, and season.</p> <p>Apertures Reflective Ceiling Clerestory Light Tube Light Tube Skylight Monitor</p> <p>Dimmer/Timer Low Partitions Shallow Spaces Window Size/Shape Program Layout Program Layout</p>
	Comfort	<p>Comfort requires not only adequate levels of light for the task being performed to prevent strain but also, the avoidance of glare from excessive levels of light. Tasks should be considered in this category as computers should face away from the light at a twenty degree angle.</p> <p>Horizontal Shading Vertical Shading Internal Shades Dimmer/Timer Vegetation Electrochromic Glazing</p> <p>Bries Soleil Light Gradation</p>
	Color Rendering	Color rendering is the quality of color representation provided by daylight. Daylight has the most efficient color rendering capacity peaking for human vision at 555 green light. ¹ Color rendering relates to occupant satisfaction, relaxation/alertness, and community (promotion of gathering activities).
	Quality	<p>Color quality is best under natural conditions in which the full spectrum of visible light is available for color rendering with no energy production required.</p> <p>Visible 380-780nm</p>

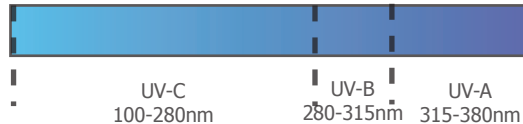

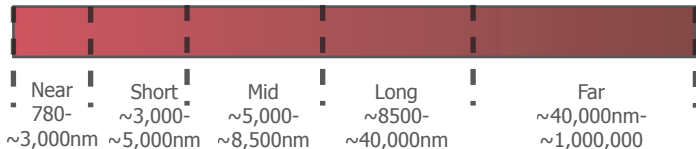
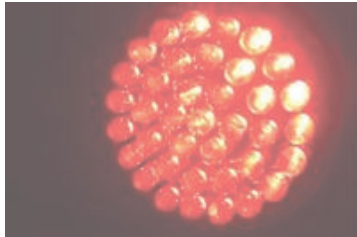
1 - Reinhart, Christopher, "Daylighting Handbook," 2014.

<div data-bbox="127 338 522 707"> <h3>Non-Visual</h3> <p>Daylight</p> <p>Ultraviolet 100-380nm Visible 380-780nm Infrared 780-1,000,000nm</p> </div>	<p>Non-visual daylight refers to the spectrum of light produced by the sun that are not visible: ultraviolet light <380nm short waves and infrared light > 780nm long waves. Non-Visual effects takes into consideration the biological effects of the nonvisual spectrum and the non-visual effects of the visible spectrum. This is to say that the entire daylight spectrum is taken into consideration in the manner it effect the biology of the body without regard to the perception an occupant may have of the world. Non-visual light is detected by the ganglion cells in the eye and interpreted by the Suprachiasmatic Nucleus of the brain.</p>		
	<h2>Circadian Rhythm</h2>	<p>Circadian Rhythm refers to the effect of light exposure on the bodies twenty-four hour cycle. Blue lights (ultraviolet) have the ability to stimulate the Suprachiasmatic Nucleus (scn). This stimulation keeps the pulsating cells of the scn in time with each other. When the cells are in time with each other the body is able to regulate melatonin and cortisol levels and maintains the bodies pattern of behavior. Circadian Rhythm supports medical need, occupant satisfaction, alertness, nutrition, physical activity, and community.</p>	
	<h2>Jump Start</h2>	<p>Jump start or “phase advance” as defined by Maryline Andersen refers to the period of time in the morning during which exposure to high levels of light and blue ultraviolet light kick start the circadian cycle, alerting the body that it should begin its daily cycle. Night workers should be exposed to high levels of blue ultraviolet light to simulate daytime biological activity.¹</p> <div data-bbox="1134 808 2989 1179"> <div> <p>Daylight Mid-day Alerting - Good For Working Environments</p> <p>Early Morning Face Sun To Become More Alert Work Areas Look South East</p> <p>Evening Sun Less Important to Work Environment Extends Past Work Day</p> </div> <div> <p>East Morning Light - Infrared Jump Start Circadian Cycle</p> <p>West Evening Light - Infrared Conclude Circadian Cycle</p> </div> <div> <p>Calming Red</p> <p>Alerting Blue</p> </div> <div> <p>Parallel Unpolarized</p> <p>SE-09</p> <p>Scattering Angle - Altitude For Solar Rays on Small Particles (.01 um)</p> <p>Graph base curve courtesy of http://www.philipaven.com/p8b.html</p> </div> </div> <div data-bbox="1209 1116 1476 1151">Building Orientation</div> <div data-bbox="1650 1116 1926 1151">Program Distribution</div> <div data-bbox="2038 1116 2256 1151">Facing Direction</div>	
	<h2>Set Back</h2>	<p>Set back refers to the manner in which the day should be ended. Low light levels and yellow/red infrared light has a calming effect on the body. Excessive blue light should be avoided in the evening, as it will offset the sleep wake cycle.</p> <div data-bbox="1134 1306 2989 1632"> <div> <p>Daylight Mid-day Alerting - Good For Working Environments</p> <p>Early Morning Face Sun To Become More Alert Work Areas Look South East</p> <p>Evening Sun Less Important to Work Environment Extends Past Work Day</p> </div> <div> <p>East Morning Light - Infrared Jump Start Circadian Cycle</p> <p>West Evening Light - Infrared Conclude Circadian Cycle</p> </div> <div> <p>Alerting Blue</p> <p>Calming Red</p> </div> <div> <p>Core: Bath, Closets, Circulation, Mechanical</p> <p>Light Atrium</p> <p>Horizontal Circulation</p> <p>Periphery: Work Spaces, Lounges, Meeting Rooms</p> </div> <div> <p>Enter - 1</p> <p>Circulate - 2</p> <p>Work - 2</p> </div> </div> <div data-bbox="1209 1588 1485 1622">Building Orientation</div> <div data-bbox="1681 1588 1961 1622">Program Distribution</div> <div data-bbox="2073 1588 2290 1622">Facing Direction</div> <div data-bbox="2371 1588 2588 1622">Program Layout</div> <div data-bbox="2641 1588 2850 1622">Light Gradation</div>	
	<h2>Digestion</h2>	<p>Digestion and eating habits are stimulated by the production of cortisol levels as a result of blue light triggered by mid-day lights.</p>	

1 - M. Andersen, j. Mardaljevic, S.W. Lockley, AFramework For Predicting the Non-Visual Effects Of Daylight - Part 1 Photobiology-based model, Light Research and Technology, vol 44 (1), pp. 37-53, 2012.

Alertness		Alertness refers to the body's ability to focus. When the scn is stimulated by blue ultraviolet light, sleep educing melatonin levels are sup-pressed and the person exposed to the light is more alert, able to think more efficiently. Alertness supports occupant satisfaction, alertness, and physical activity.
	Alerting	<p>Blue ultraviolet light and high levels of luminance stimulate the scn. When the scn is stimulated, melatonin levels are suppressed and the person exposed to the light is more alert, able to think more efficiently. Mid-day light is composed primarily of blue, ultraviolet light. ¹</p> <div><div><p>Ultraviolet Light - 100nm<UV<400nm</p></div><div><p>Program Layout</p></div><div><p>Shallow Spaces</p></div></div>
	Calming	<p>Low levels of luminance and yellow/red, infrared light will promote the production of melatonin that induces a tired, sluggish feeling in the body. Morning and evening light contain greater levels of infrared light when one may wish to be sleeping.</p> <div><div><p>Infrared Light - 780nm<IR<1,000,000nm</p></div><div><p>Program Distribution</p></div><div><p>Deep Spaces</p></div></div>
Vitamin D		<p>Vitamin D is produced through the interaction of UVB light with the skin. Vitamin D is necessary for the health of skin and bones. It also has positive effects on mood. UVB light is only available from the sun when the altitude of the sun is fifty degrees or greater. Vitamin D supports physical activity, medical nee, occupant satisfaction, and alertness. ¹</p> <div><div><p>Scattering Angle - Altitude For Solar Rays on Small Particles (.01 um) Graph base curve courtesy of http://www.philiplaven.com/p8b.html</p></div><div><p>UV-B Availability Altitude>50</p></div><div><p>Building Orientation</p></div></div>

1 - John Stanislav Sladar, "Beyond Blue: The Non-Visual Effects of Light and Colour in Architecture," Architecture Theory Review 19.2 (2014): 176-178.–

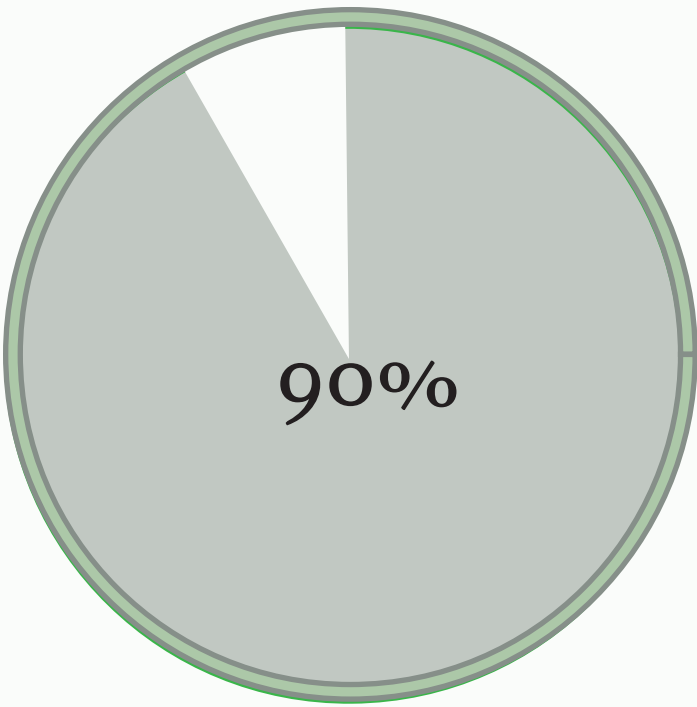
Light Therapy		The full spectrum of daylight has a profound impact on health. Adequate access to daylight can improve mood and avert seasonal effective disorder. If light levels are not sufficient to provide such effects due to building requirements, mechanical substitutions are available. Light Therapy supports medical need, occupant satisfaction, and alertness.
	Ultraviolet	<p>The use of ultraviolet light waves have been used to treat seasonal effective disorder because of the stimulation in the brain, which releases various hormones and stimulates the production of chemicals in the brain that promote happiness such as serotonin. ¹</p> <div><div><p>Ultraviolet Light - 100nm<UV<400nm</p><p>UV-C 100-280nm UV-B 280-315nm UV-A 315-380nm</p><p>Light Spectrum Consideration</p></div><div><p>Image Courtesy of light-therapy-led.com</p></div></div>
	Infrared	<p>Infrared light waves have been used to treat aches and pains by improving circulation and reducing inflammation.</p> <div><div><p>Ultraviolet Light - 100nm<UV<400nm</p><p>Near 780-~3,000nm Short ~3,000-~5,000nm Mid ~5,000-~8,500nm Long ~8500-~40,000nm Far ~40,000nm-~1,000,000</p><p>Light Spectrum Consideration</p></div><div><p>Image Courtesy of DiabetesHealth.com</p></div></div>
Thermal Comfort		Thermal Comfort refers to the adequacy of temperature with in a space to meet the needs and satisfaction of the occupants as a result of thermal gains from the introduction of daylight. This best relates to medical need, occupant satisfaction, Alertness, promotion of commu- nity spaces, and is closely related to vegetation and ventilation.
	Heat Lag	The use of materials and spatial configurations can maximize and minimize thermal gains according to zones.
	Temperature	The introduction of daylight is intrinsically linked to the introduction of thermal gain based on the energy levels of light rays. Thermal gains should be mitigated in the hot season and exploited in the cold season- regionally determined by climate.

1 - John Stanislav Sladar, "Beyond Blue: The Non-Visual Effects of Light and Colour in Architecture," Architecture Theory Review 19.2 (2014): 176-178.↵

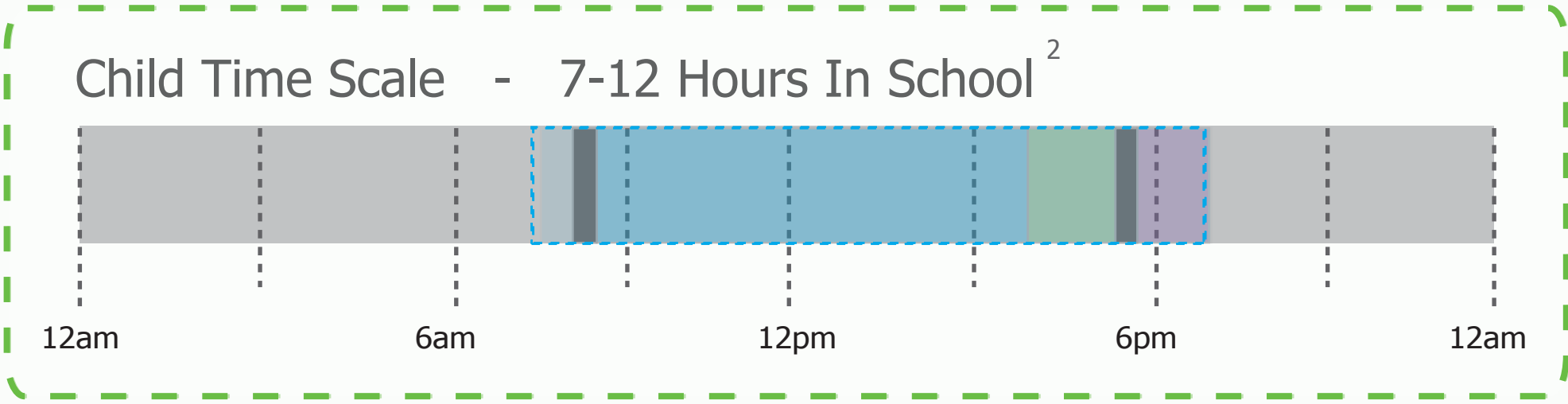
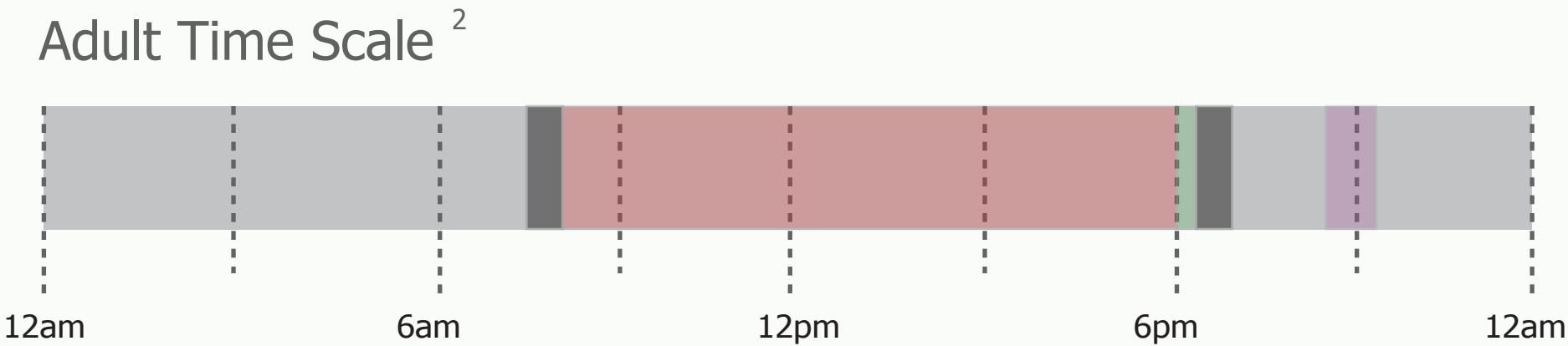
Application Of The Conceptual Framework - Educational Facilities

Building Types With The Biggest Effect On Health: Based on Time

Average Weekday:



Americans Spend 90%
Of Their Time Indoors¹



- 1 - Home
- Transportation
- 2 - Work
- 3 - School
- Outdoors
- Other

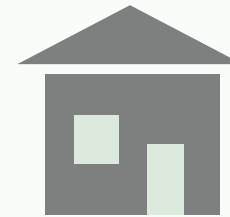
1 - Julia Salerno, "Revolutionizing Human Health and Well-being In The Built Environment," Canadian Interiors 51.6 (2014): 15-17.
2 - Beauru Of Labor Statistics, "American Time Use Survey", 2014, <http://www.bls.gov/tus/charts/chart1.pdf>

Building Types With The Biggest Effect On Health: Based on Time Budget

Where Do People Spend Most of Their Time?

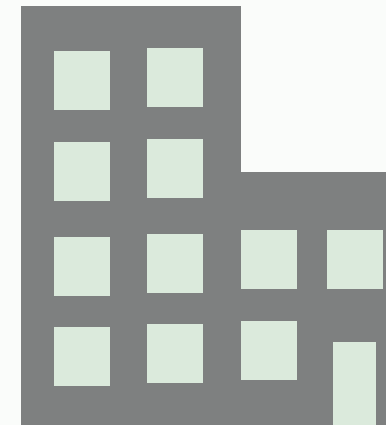
1 - Home/Residence

-On average 12 hours/day



2 - Work

-On average 7.7 hours/day



3 - School

-Required 6.5-7 hours/day

-**Up to 12 hours** - after school activities



Why Educational Facilities? Children are more susceptible to their environmental conditions:

- Bodies are still developing¹

Proportionally larger BSA (Body Surface Area) = faster absorpsion of toxins, faster heat/fluid loss

Thinner skin = Absorbe toxins faster

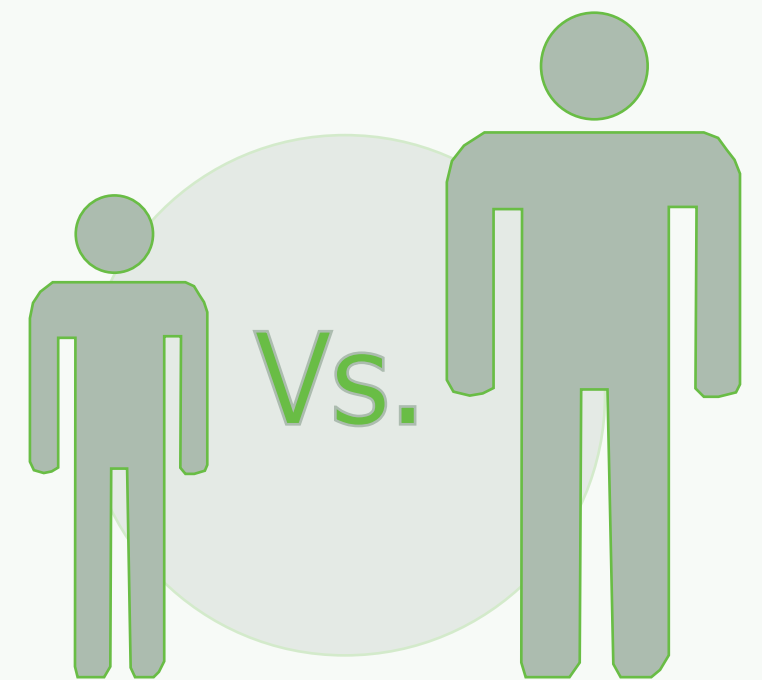
Rapidly Dividing Cells = More suseptable to radiation

Higher repiratory rates = More suceptable to air-born agents

Immature Immune Systems²

- Unable to identify environmental threats¹

- Considerations of the future



1 - American Academy for Pediatrics Council of Environmental Health, Pediatric Environmental Health 3rd edition; US Environmental Protection Agency, IAQ Tools for Schools.

2 - "Difference between children and adults," The Royal Children's Hospital Melbourne, accessed Dec. 2015, http://www.rch.org.au/studentorientation/5_children_and_adults/Differences_between_children_and_adults/

Considerations For Educational Facilities: CHIPs - appendix for Manual of Planning Standards

Health Benefits:

Improved concentration, vitamin D production, regulated circulation, regulated sleep-wake patterns, general satisfaction.

Educational Benefits:

“appropriate lighting improves test scores, reduces offtask behavior, and plays a significant role in student achievement.”

Scheinder, 2002

- Sites Lemasters' 1997 study linking test scores to daylighting

Site and Program

Westside Academy Of Blodgett

Proposed redesign of the Blodgett Middle School to enhance daylight performance

Originally built 1915

In Syracuse, Blodgett is in the worst physical condition with the highest percentage of poverty.

2000 - School board called for renovations on Blodgett - cancelled plans in 2008 due to insufficient funds

Renovations would cost more than a new building at minimum \$46 million

2001 Abundant life - \$410,000 project - renovated library and media center.



Westside Academy Of Blodgett

Proposed redesign of the Blodgett Middle School to enhance daylight performance

Westside Academy At Blodgett

Innovation Zone School (1 of 7)

Grades 6-8

411 Students

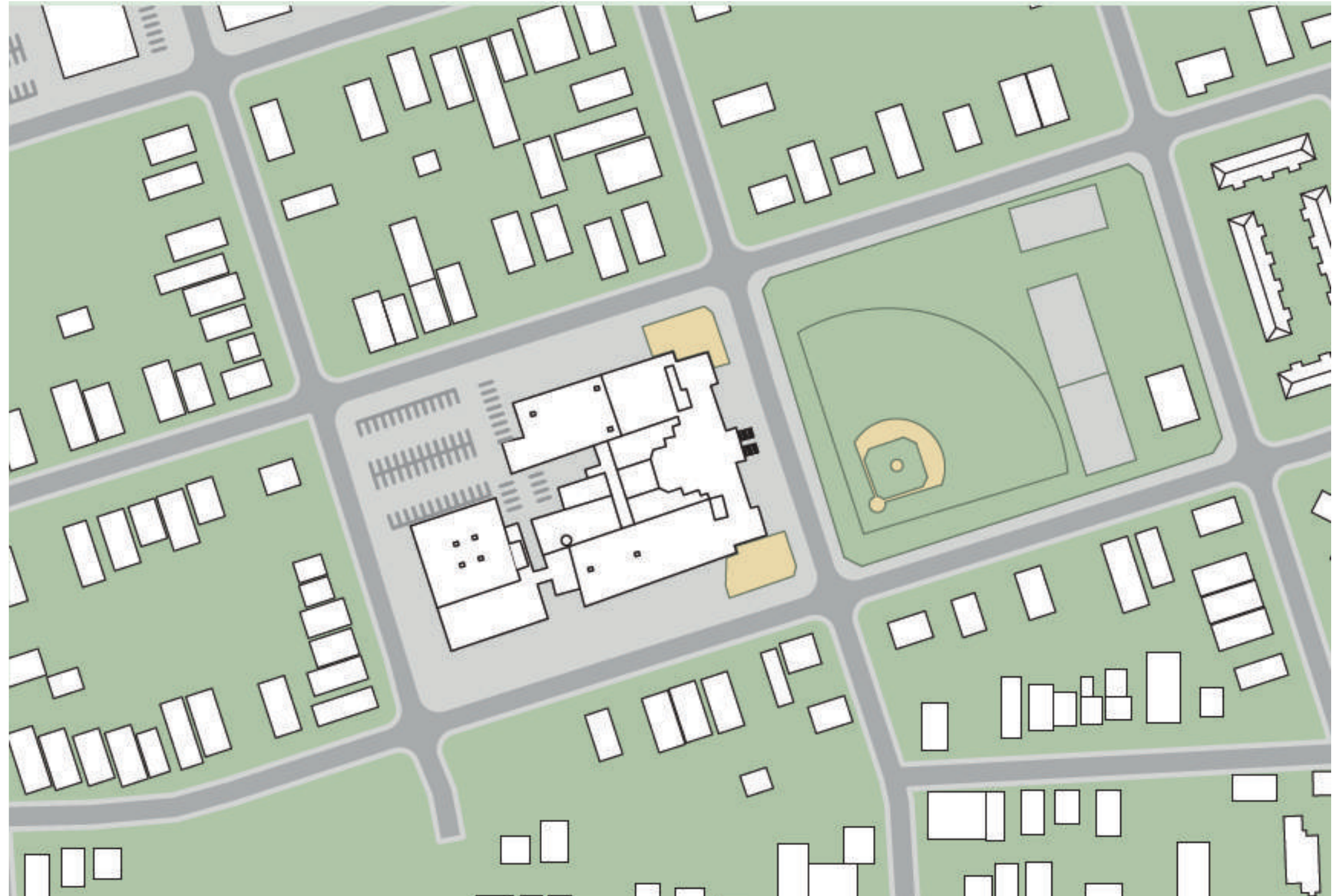
41 Teachers

Hours: 8:00 AM-3:36 PM

Student/Teacher Ratio - 10

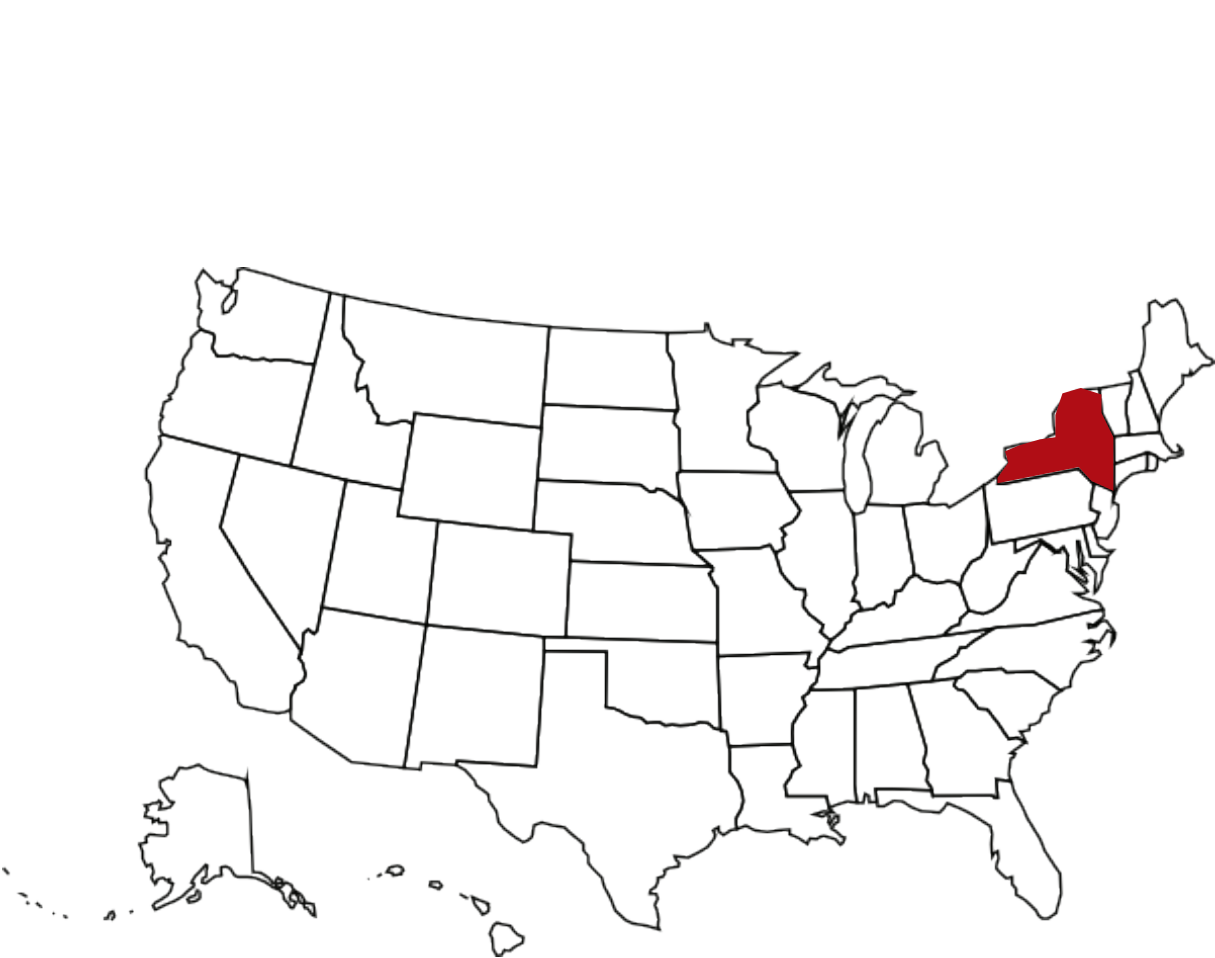
81.6% Free Lunch

ranked worse than 99.6% schools
in NY according to schooldiggers -
2014-2015 NYS assessment test
scores (7.13 average score)

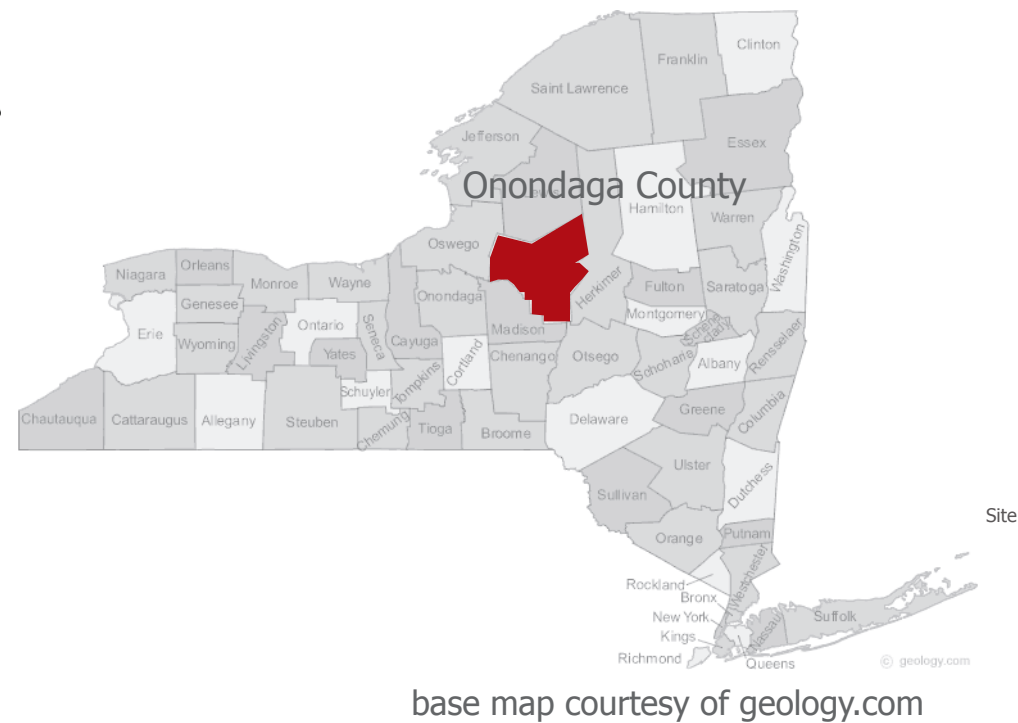


Global Location

Blodgett Location



New York State



Onondaga County



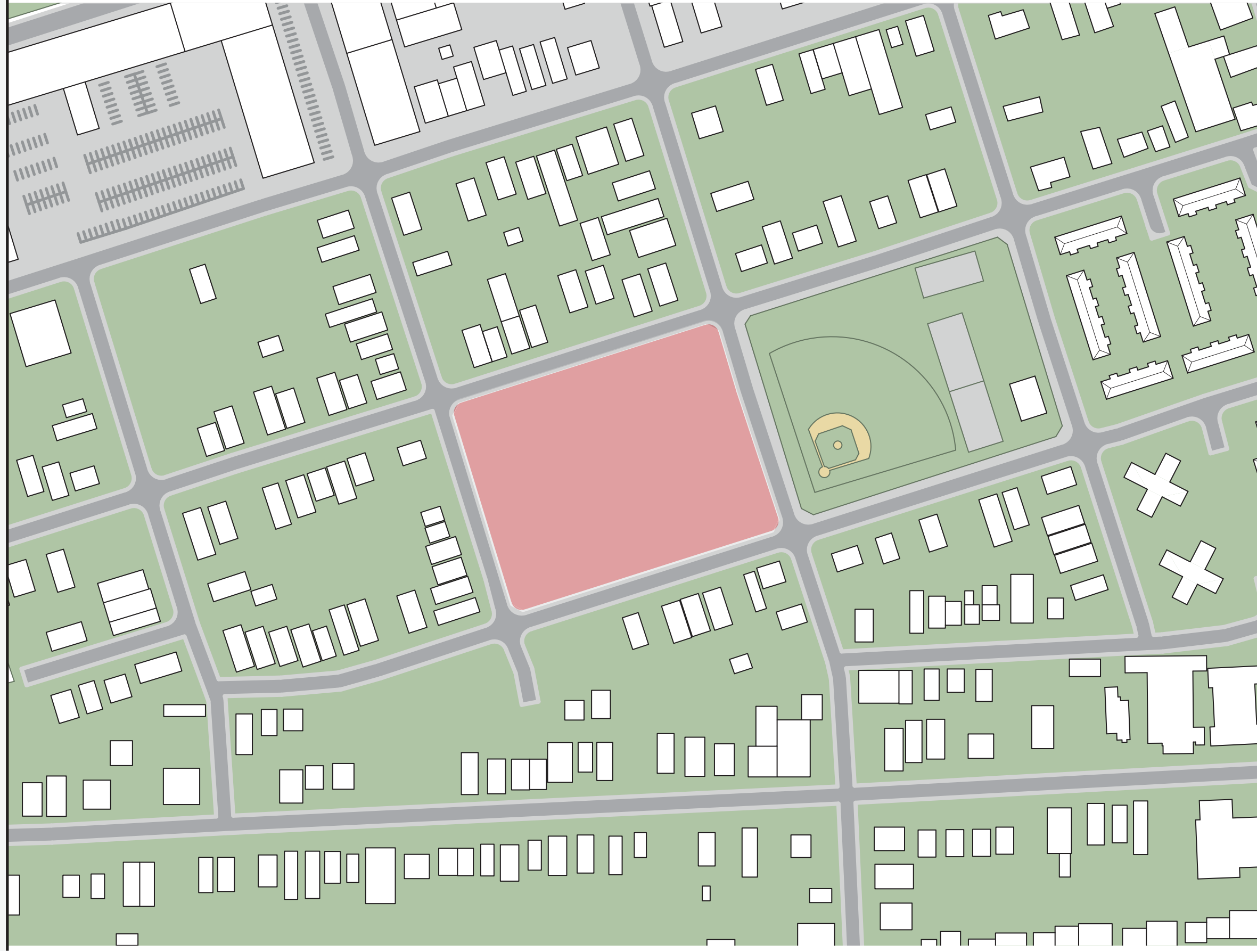
Near Westside -
Syracuse

Site

The site is located in the north-east-ern part of the Near Westside, Syracuse, NY, near Down Town. The site is considered a part of Zone 13 Residential classification RB and is abutted by - residential RAA and RB.



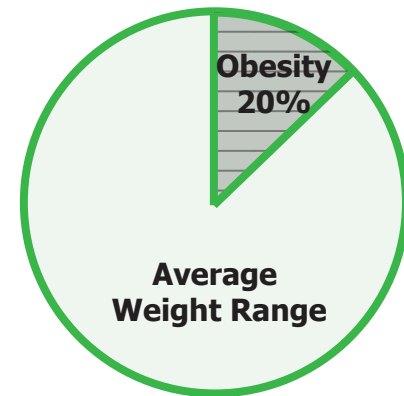
Zoning Map Courtesy of syrgov.net/atlas



Regional Demographics

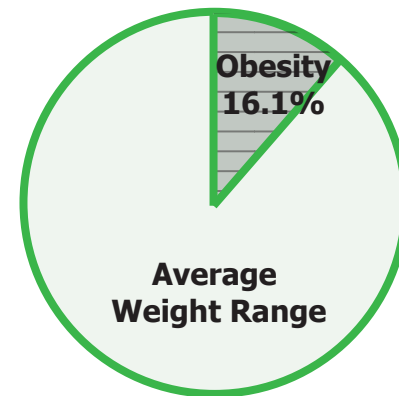
The Near Westside neighborhood of Syracuse, NY has been deemed a recent recipient of the Healthy Neighborhoods Fund Initiative by the New York State Health Fund due to its low poverty rates among children, inaccessibility to nutritious food sources, inadequate means of safe exercise, high rates of 'ethnic' infant mortality, and high rates of obesity/diabetes. As a recipient of the Health Neighborhoods Fund Initiative, the Near Westside received \$250,000 to create a Learning Center for Public Health Promotion that focused on education, reviving sports fields, and increasing the availability of nutrition resources.¹

Adult Obesity



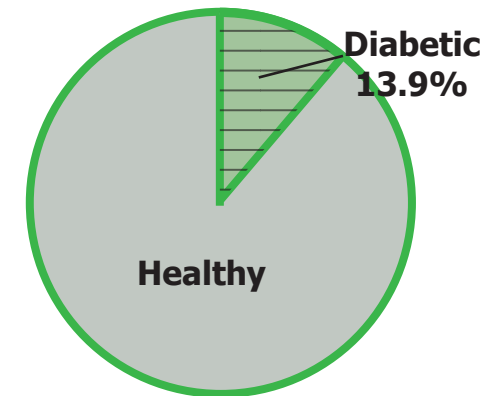
20% Obesity

Child Obesity



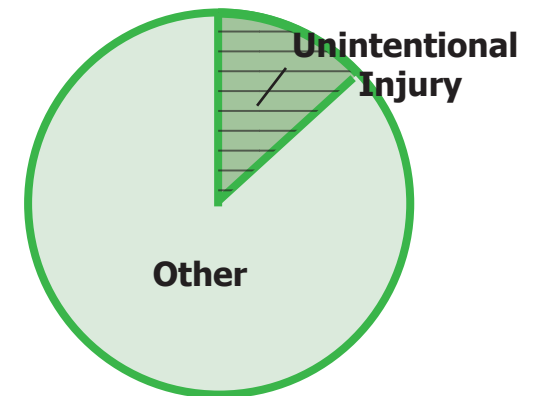
16.1% Obesity

Adult Diabetes



13.9% Diabetes

Mortality Rate



Unintentional Injury
Mortality = 31.1%

Newborn Drug Related Discharge Rate = 248.3/10000 = 3x NYC

One of the highest child poverty rates in the Unitedway of Central NY

Three major health concerns (ongov.net):

- 1 - Physical Activity/Nutrition
- 2 - Mental Health/Substance Abuse
- 3 - Maternal and Child Health



1 - "Full List of Selected Recipients For 'Healthy Neighborhoods fund,'" NYS Health Foundation, accessed November 2015, nyshealthfoundation.org/our-guarantees/healthy-neighborhoods-fund-recipients

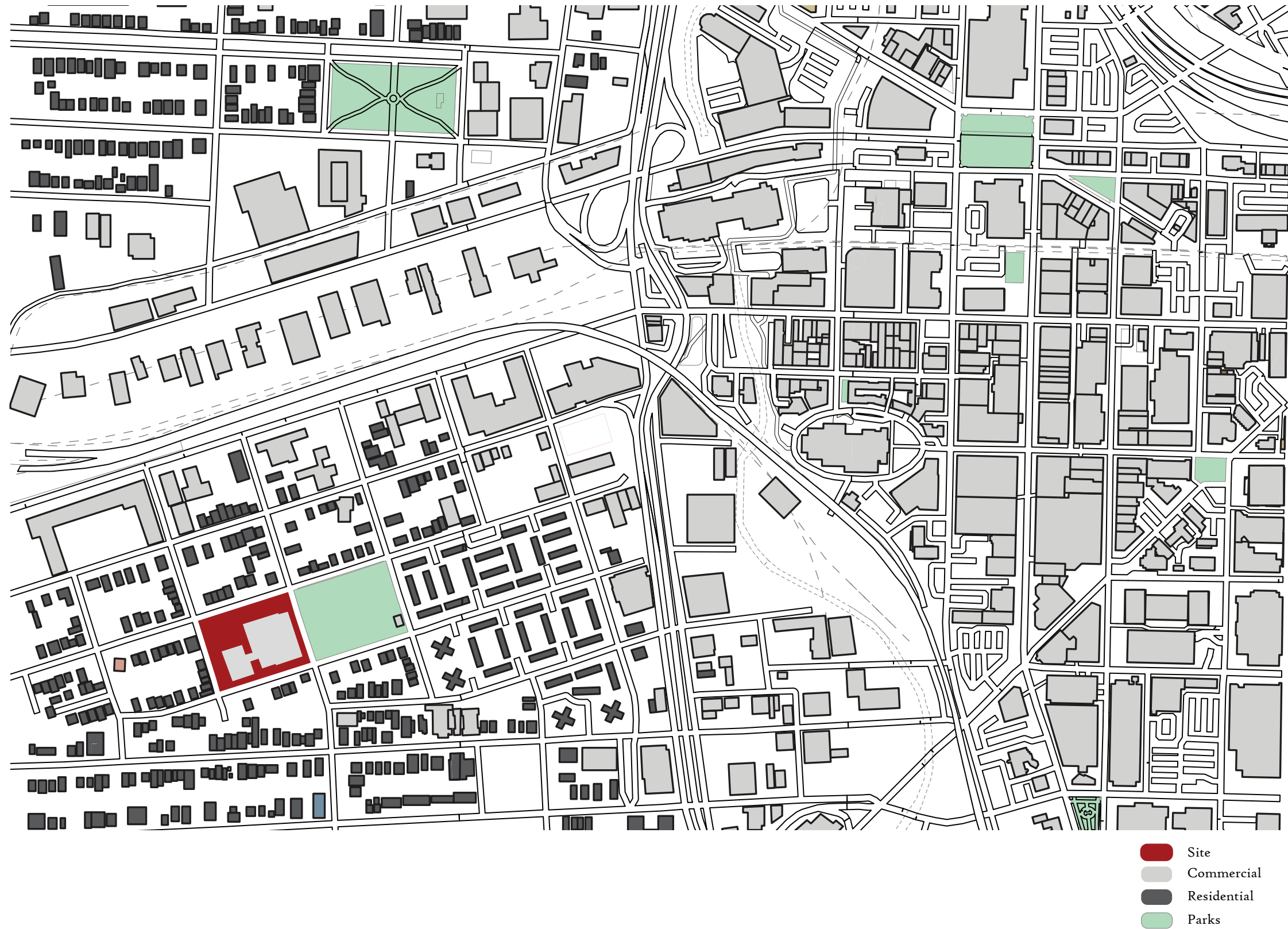
Site Analysis

Building Type Distribution



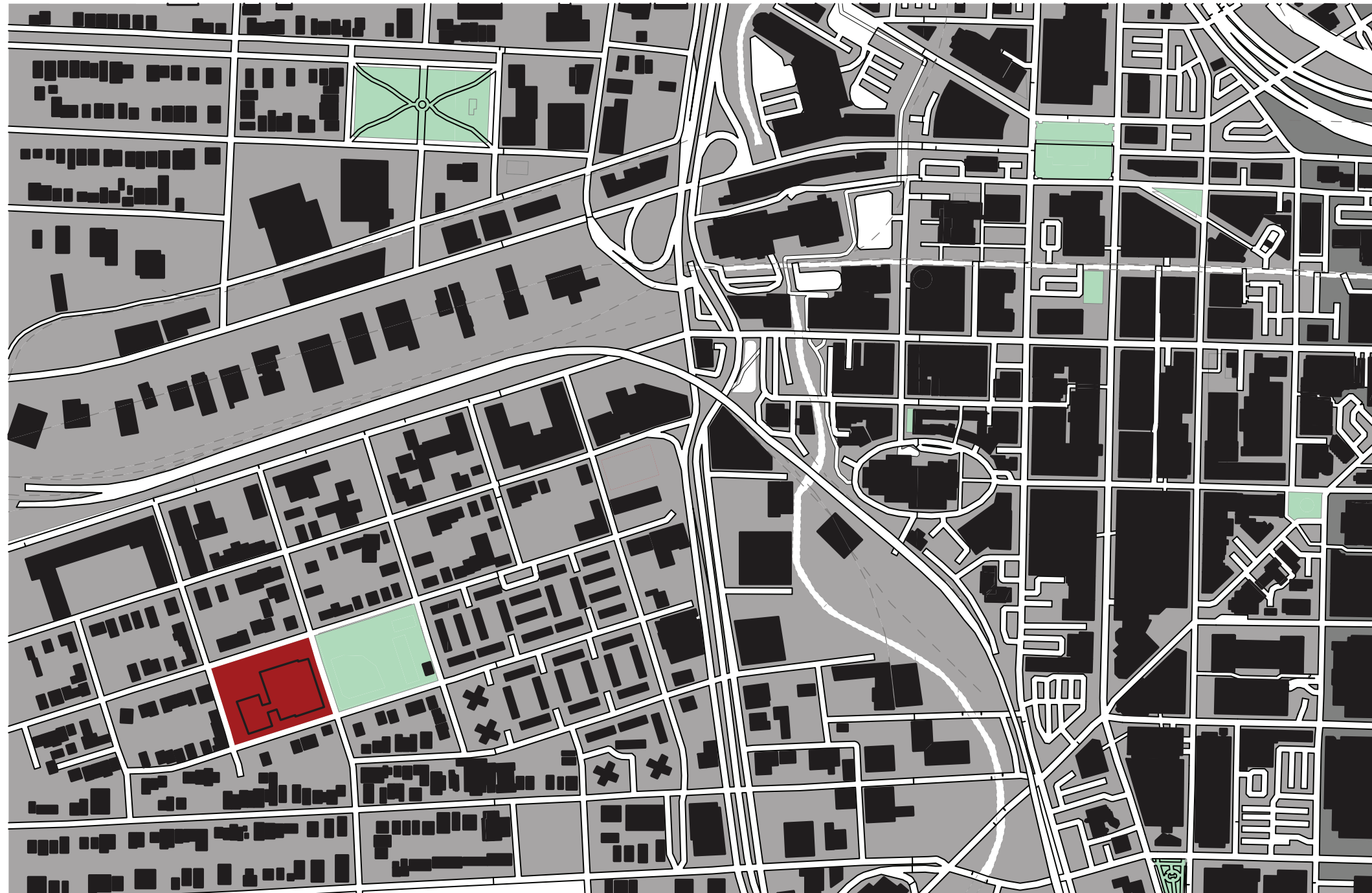
Site Analysis

Park Distribution



Site Analysis

Circulation - Density

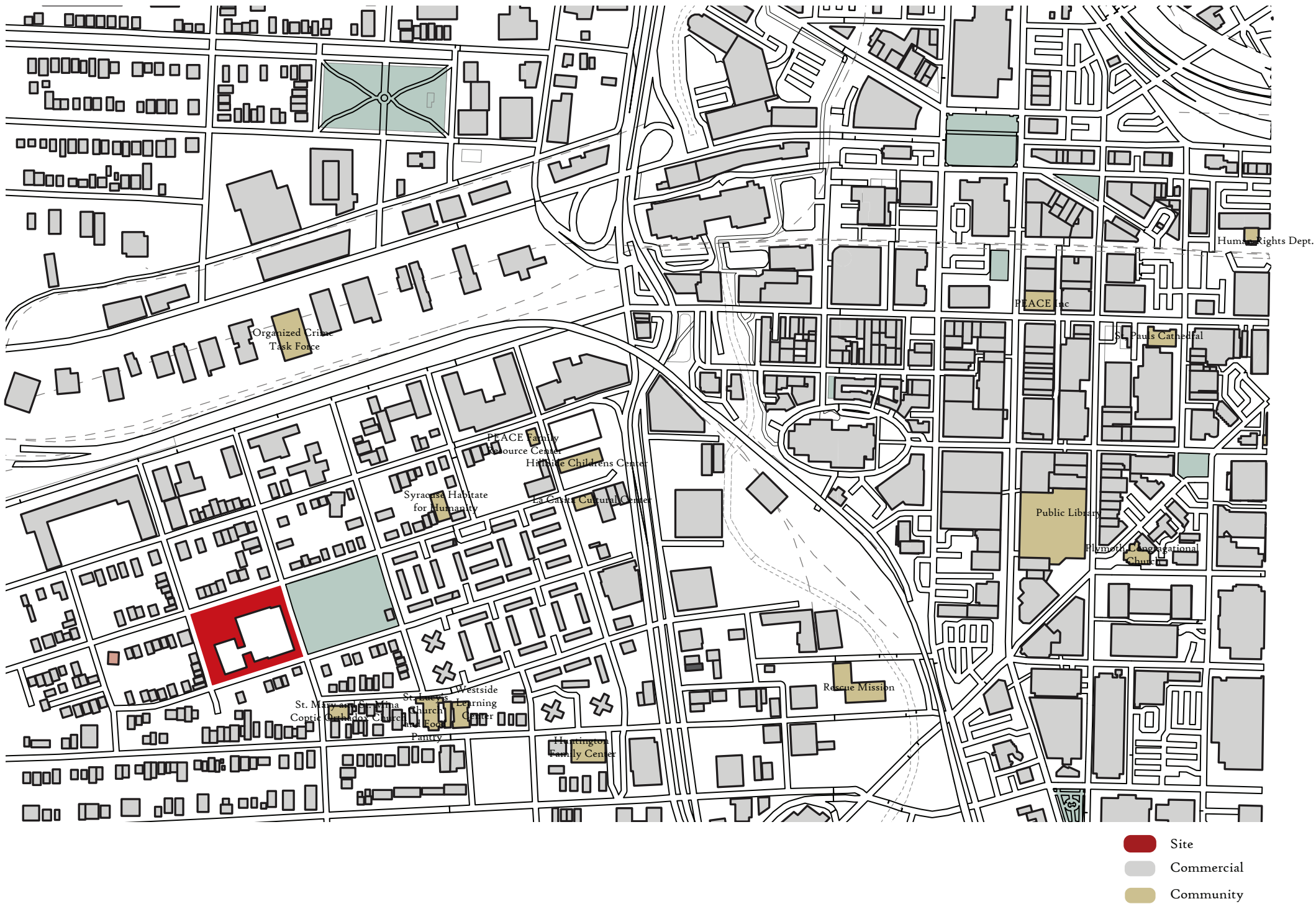


- Site
- Commercial
- Residential
- Parks
- Non-Mobile

Site Analysis

Locating Community Resources and Improvement Programs

Building Type Distribution



PEACE Family Resource Center



Hillside Children's Center



Westside Family Health Center



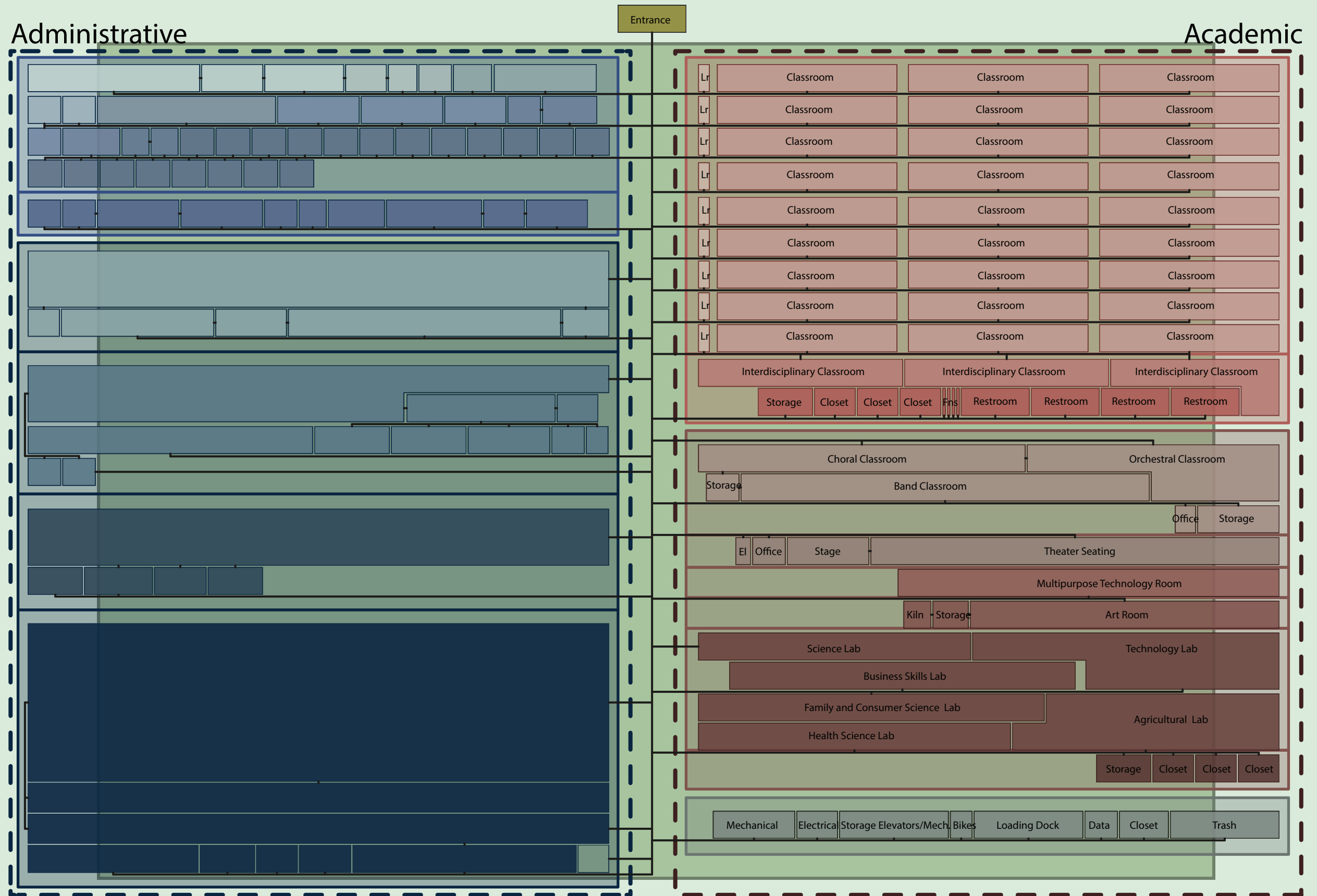
La Casita Cultural Center



Program Requirements

ADMINISTRATIVE BUILDING COMPONENTS				ACADEMIC BUILDING COMPONENTS			
Space name	NSF	Quantity	ASF	Space name	NSF	Quantity	ASF
Administrative Center				Support Spaces			
Administration				Entry	250	1	250
Principal's Reception Area	630	1	630	Resource Center			
Principal's Office	225	1	225	Main Library	4400	1	4400
Principal's Conference Room	290	1	290	Library Office	115	1	115
Assistant Principal's Office	150	1	150	Audiovisual ITV Distribution Room	560	1	560
Assistant Principal's Reception Area	105	1	105	Data Communications Equipment Room	260	1	260
Office Manager	120	1	120	Computer Science	1000	1	1000
Administrative Work Room	140	1	140	Printing Area	185	1	185
Administrative Storage Room	375	1	375	Resource Center NSF total			6520
Restrooms	120	2	240	Program Efficiency Ratio			0.7
Pupil Reception Area	650	1	650	Resource Center GSF total			9314
Counselor's Office	300	2	600	Dining Area			
Counseling Room	225	1	225	Student Cafeteria	3500	1	3500
Mail/Package Storage	120	1	120	Kitchen	545	1	545
File Storage	200	1	200	Walk-in Refrigerator	275	1	275
Itinerant Staff Office	120	1	120	Walk-in Freezer	275	1	275
In-House Suspension Room	210	1	210	Dry Storage	300	1	300
Security Station	100	2	200	Managers Office	120	1	120
Faculty Offices	125	20	2500	Cafeteria Staff/Lounge	120	1	120
Administration NSF total			7100	Restroom (Staff)	120	1	120
Program Efficiency Ratio			0.7	Custodial Closet	150	1	150
Administration GSF total			10143	Vending Machines	80	1	80
Health Service Area				Faculty Dining Room/Lounge	1045	1	1045
Health Office	100	1	100	Dining Area NSF total			6530
First Aid and Couch Room	200	1	200	Program Efficiency Ratio			0.7
First Aid Workroom	350	1	350	Dining Area GSF total			9329
Student Shower Room	150	1	150	Common Area			
Restrooms	120	2	240	Common Area	4430	1	4430
Counselor's Office	300	2	600	Student Store	200	1	200
Counseling Room	225	1	225	Restroom	250	2	500
Itinerant Staff Office	120	1	120	Custodial Office	190	1	190
Health Service Area NSF total			1985	Storage Closet	200	1	200
Program Efficiency Ratio			0.7	Common Area NSF total			5520
Health Service Area GSF total			2836	Program Efficiency Ratio			0.7
Administrative Spaces				Common Area GSF total			7886
Administration	1		10143	Gymnasium			
Health Service Area	1		2836	Gymnasium	12280	1	12280
Administrative Building Component - Floor GSF Total			12979	Outdoor Fields	ninety thousar	1	
				Playground	625	2	1250
				Vestibule	200	1	200
				Locker Room/Restroom	2200	2	4400
				Gym Office	150	1	150
				Custodial Closet	190	1	190
				Equipment Storage	820	1	820
				Electrical Room	120	1	120
				Gymnasium NSF total			19410
				Program Efficiency Ratio			0.7
				Gymnasium GSF total			27729
				Support Spaces			
				Entry	1		250
				Resource Center	1		9314
				Dining Area	1		27729
				Common Area	1		7886
				Gymnasium	1		27729
				Support Spaces Component - Floor GSF Total			72907
				ADMINISTRATIVE BUILDING COMPONENTS GSF TOTAL			85886
				Traditional Classrooms			
				Classroom	660	27	17820
				Interdisciplinary Spaces	750	3	2250
				Restroom	250	4	1000
				Drinking Fountains	10	4	40
				Custodial Closets	150	3	450
				Material Storage	200	1	200
				Traditional Classrooms NSF Total			21760
				Program Efficiency Ratio			0.7
				Traditional Classrooms GSF Total			31084
				Fine Arts Classrooms			
				Choral Classroom	1200	1	1200
				Orchestra Classroom	1400	1	1400
				Choral/String Storage Room	300	1	300
				Choral/String Office	120	1	120
				Band Classroom/Storage	1500	1	1500
				Book Storage	75	1	75
				Theater Stage	300	1	300
				Theater Seating	1500	1	1500
				Stage Office	120	1	120
				Electrical Room	55	1	55
				Multipurpose Technology Room	1400	1	1400
				Art Room	1135	1	1135
				Art Supply Room	130	1	130
				Kiln Area	100	1	100
				Science Lab	1000	1	1000
				Technology Lab	1830	1	1830
				Business Lab	1170	1	1170
				Family and Consumer Science Lab	1270	1	1270
				Health Science	1270	1	1270
				Agriculture Lab	1830	1	1830
				Custodial Closets	150	3	450
				Material Storage	200	1	200
				Fine Arts Classrooms NSF Total			18355
				Program Efficiency Ratio			0.7
				Fine Arts Classrooms GSF Total			26220
				Support Spaces			
				Mechanical Rooms	400	1	400
				Electrical Rooms	180	1	180
				Tel/Data Rooms	120	1	120
				Storage Elevators/ Elevator Machine Room	400	2	800
				Bike storage (covered, exterior)	80	2	160
				Loading dock	400	1	400
				Loading dock apron			0
				Cleaning supply/maintenance storag /lockers /restroc	150	1	150
				Trash / recycling collection	300	1	300
				Support Spaces ASF			2510
				Total Program Efficiency Ratio			0.7
				Support Spaces GSF Total			3506
				Academic Building Program Components NSF			60890
				Total Program Efficiency Ratio			0.7
				Academic Building Program Components GSF Total			86985
				Administrative Program Components GSF Total			85886
				Academic Program Components GSF Total			86985
				Overall GSF Total			172871
				Site Building			125870
				Ratio			1.3734089

Program Relationship Diagram



Evaluation

Method of Evaluation

In order to gauge the effectiveness of this proposed design process, a new school design will be proposed in place of Blodgett using the proposed design process with a particular interest in improved daylighting. The daylighting of the proposed building, the existing building, and an exemplary building will then be analyzed using DIVA for Rhino to simulate the lighting levels of the building. The results of the three will be compared to evaluate success. The proposed design should be as effective or more effective than the exemplary building and the existing structure.



Exemplary Building
CBRE Global Headquarters
LA, California

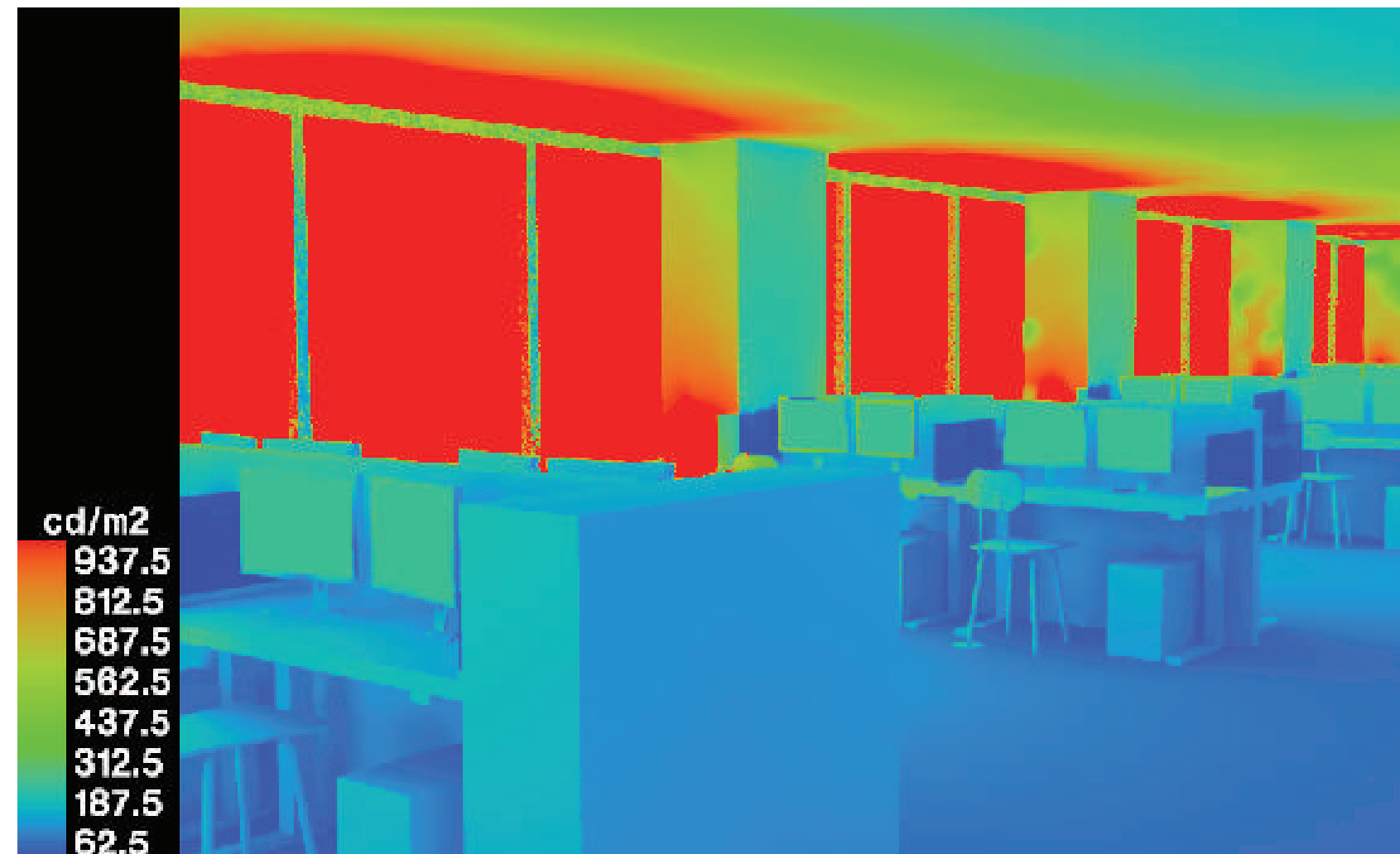
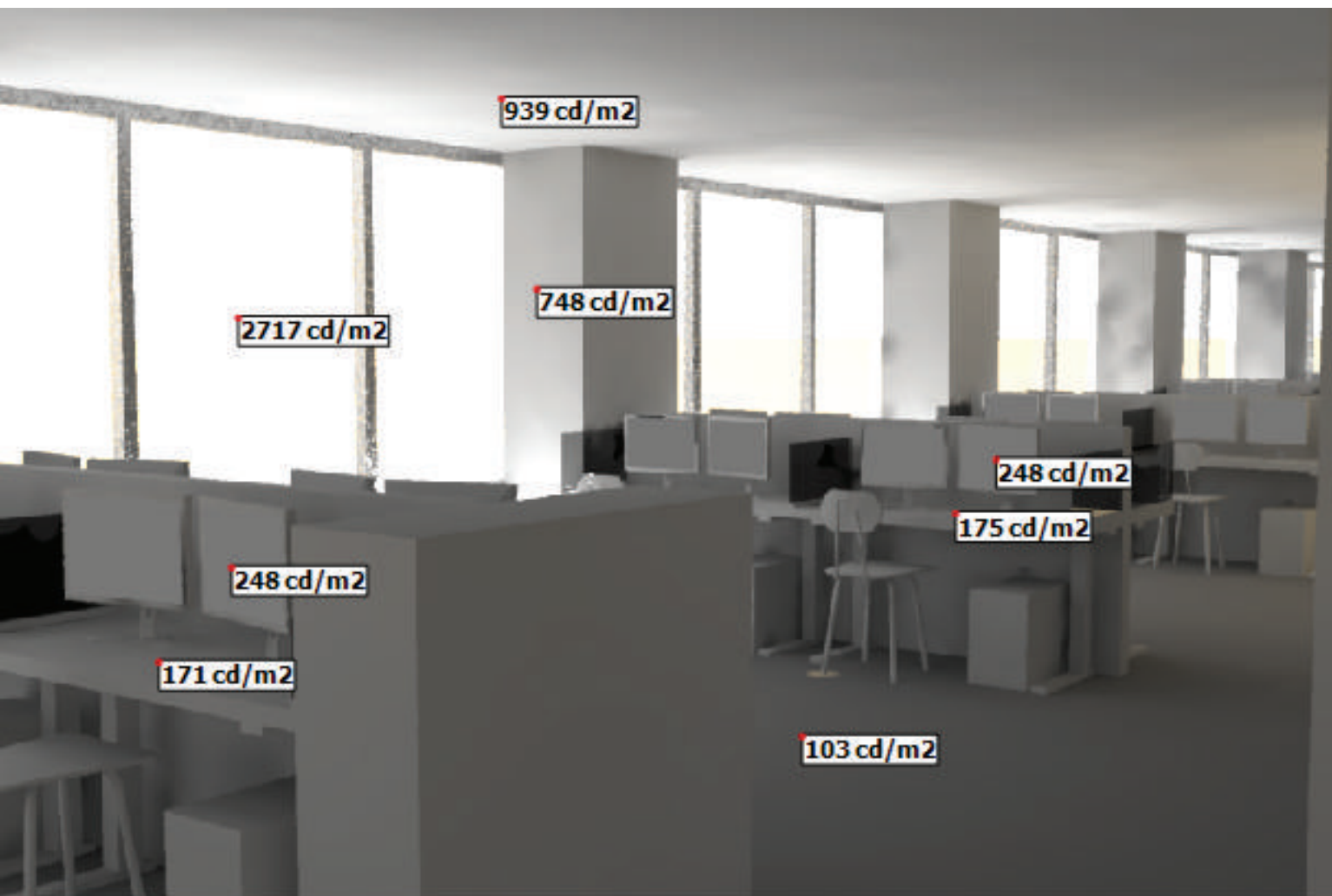


Existing Building
Blodgett Middle School
Syracuse NY



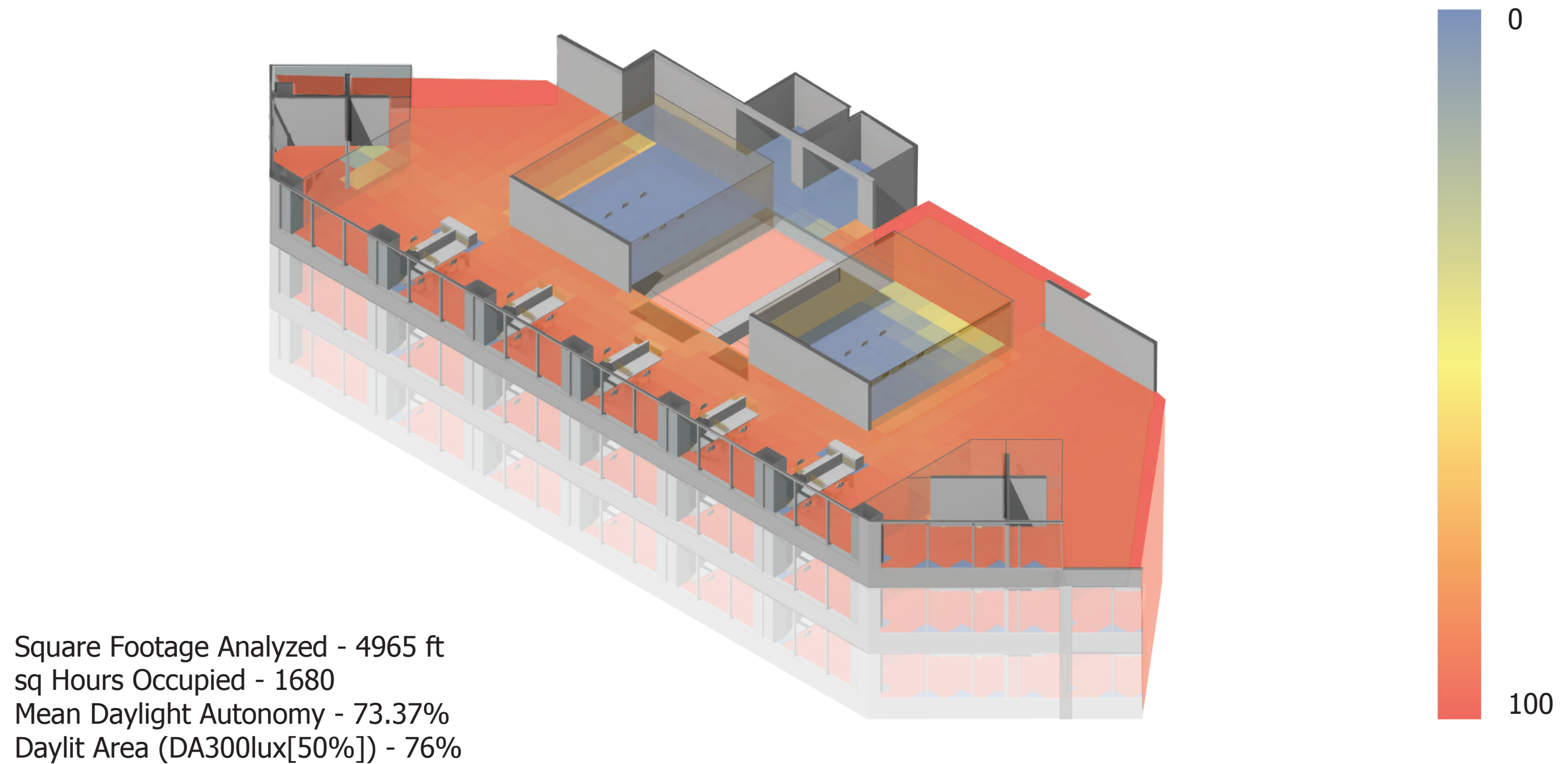
Proposed Building
Middle School
Syracuse NY

Exemplary Building - CBRE



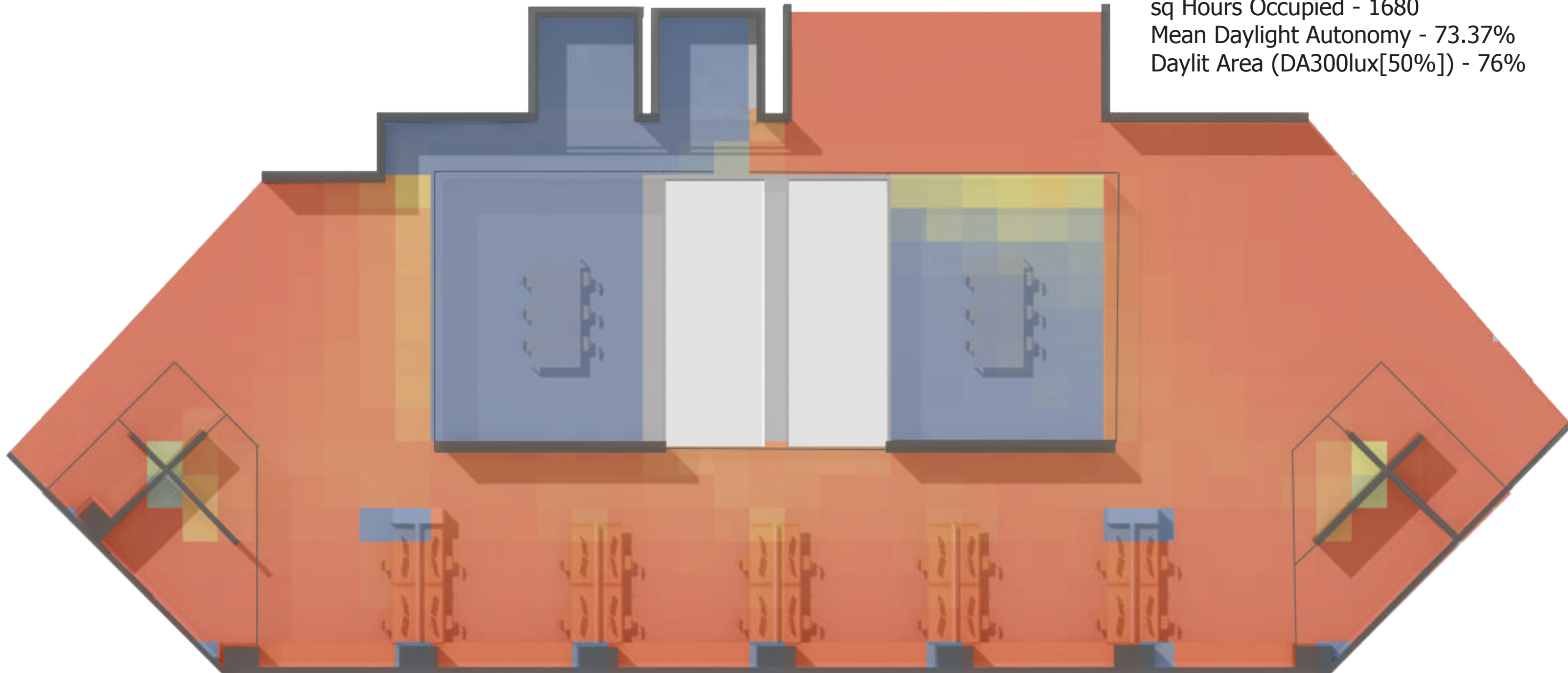
Visualizations of Southern Office Spaces - Daylight Performance

Exemplary Building - CBRE

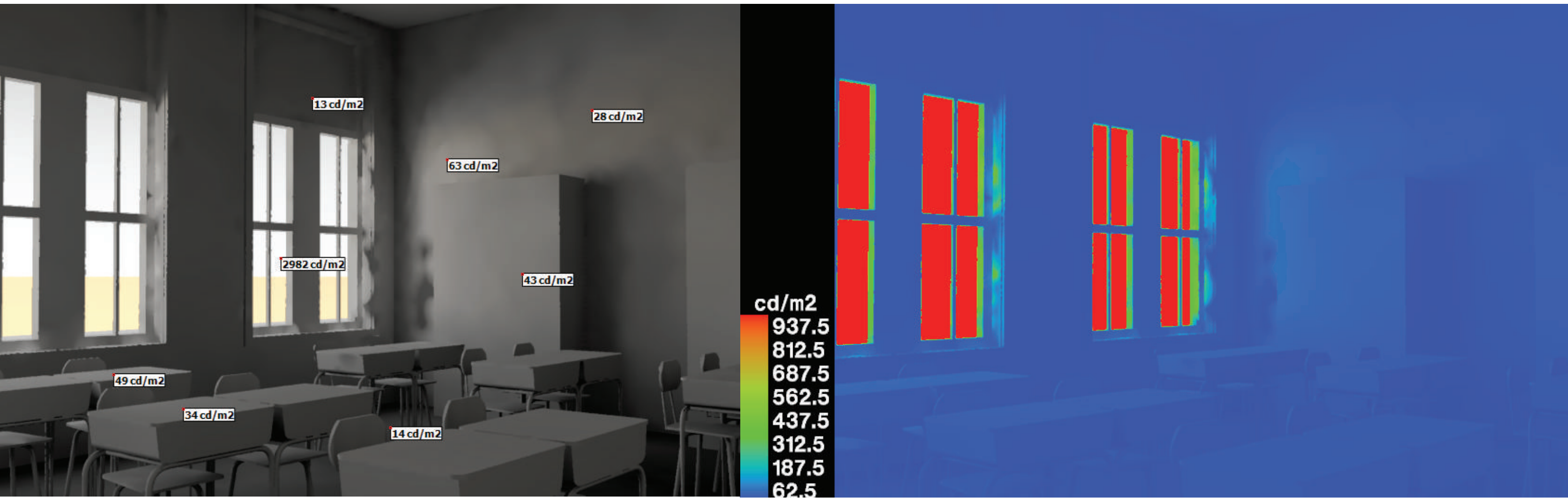


Exemplary Building - CBRE

Square Footage Analyzed - 4965 ft²
sq Hours Occupied - 1680
Mean Daylight Autonomy - 73.37%
Daylit Area (DA300lux[50%]) - 76%

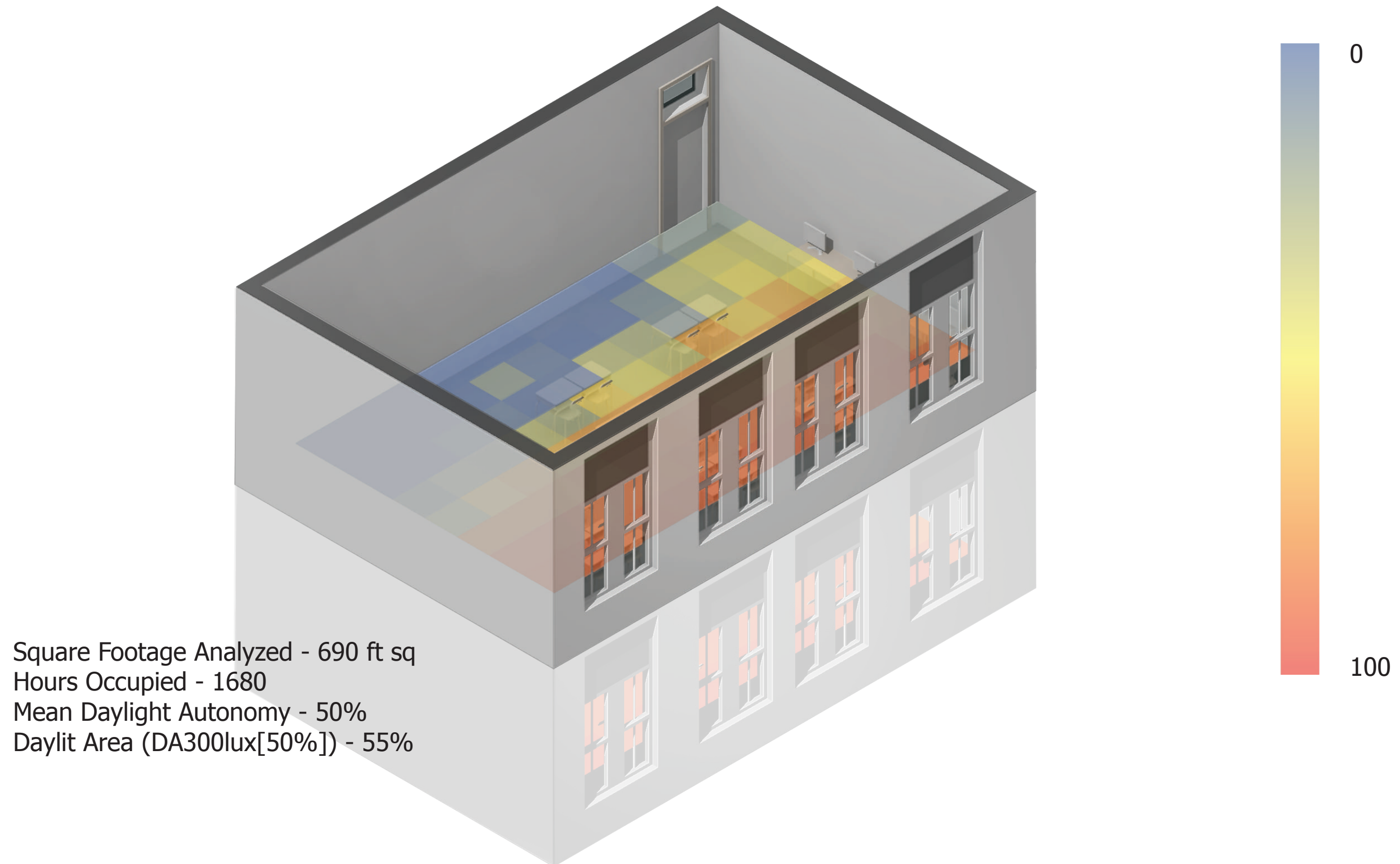


Existing Building - Blodgett

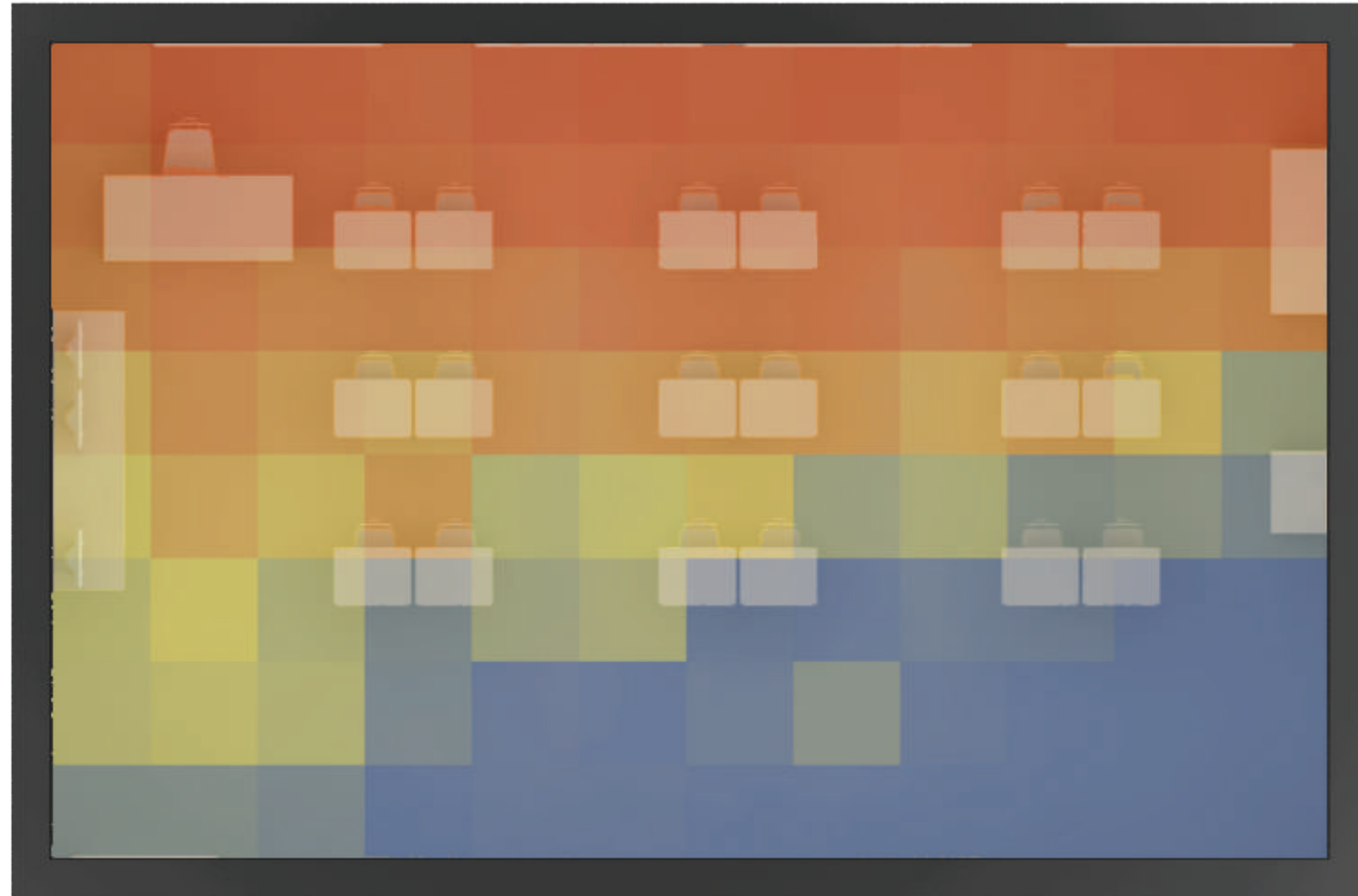


Visualizations of Northern Classroom - Daylight Performance
Assumes Full Light From The Windows - Windows Are Normally Half Closed Or More

Existing Building - Blodgett

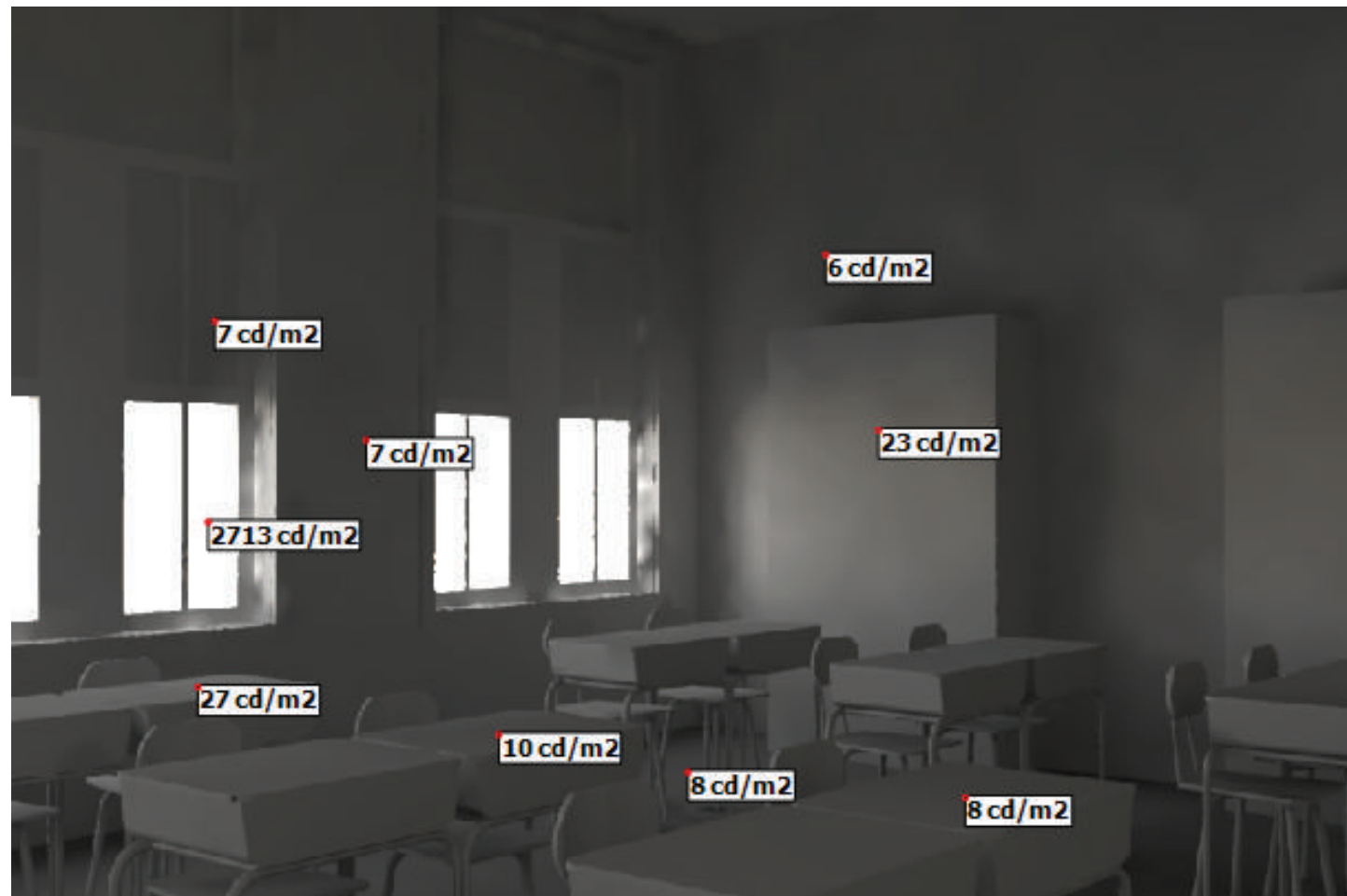


Existing Building - Blodgett



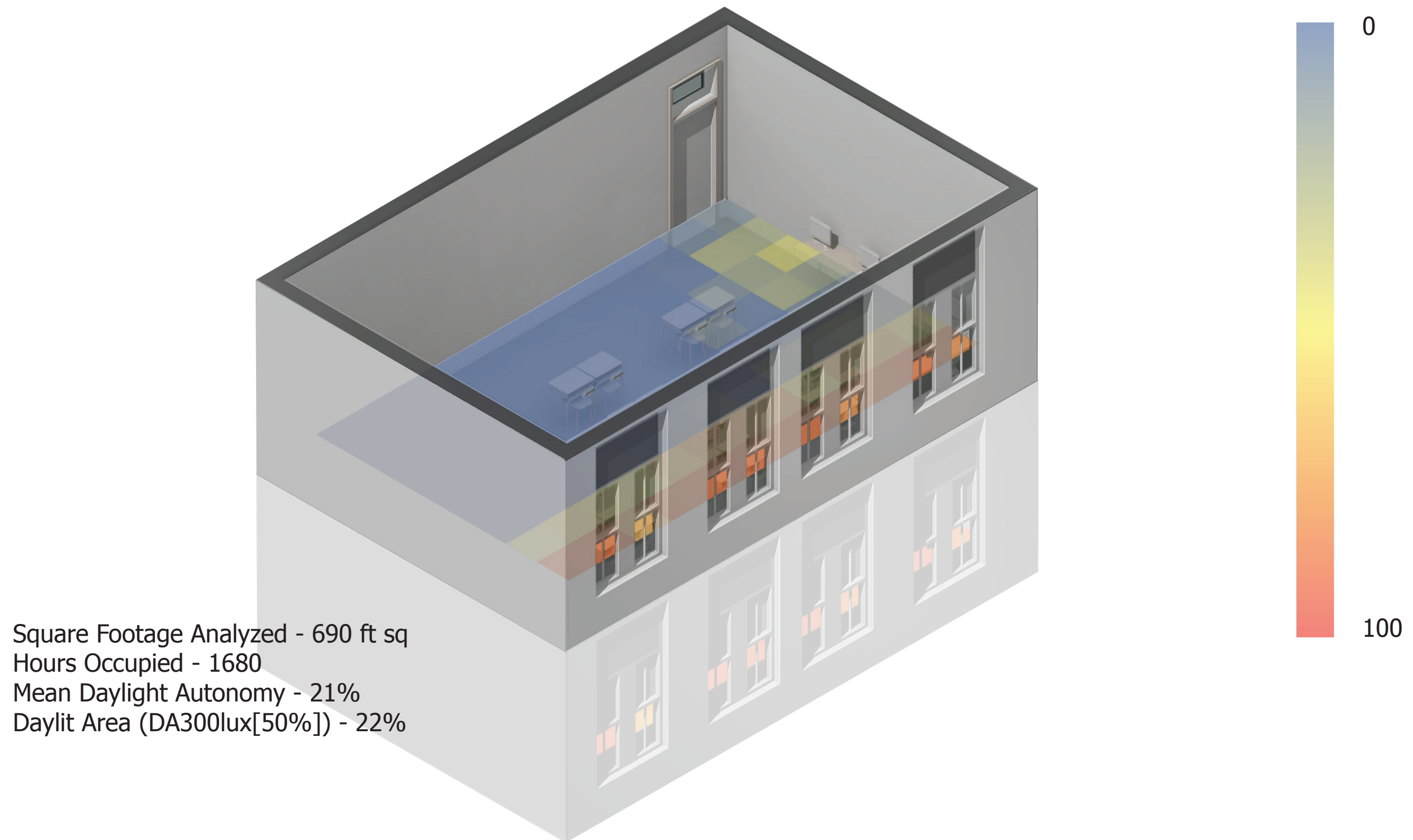
Square Footage Analyzed - 690 ft sq
Hours Occupied - 1680
Mean Daylight Autonomy - 50%
Daylit Area (DA300lux[50%]) - 55%

Existing Building - Blodgett



Visualizations of Northern Classroom - Daylight Performance
Assumes Half Light From The Windows - Windows Are Normally Half Closed Or More

Existing Building - Blodgett



Existing Building - Blodgett



Square Footage Analyzed - 690 ft sq

Hours Occupied - 1680

Mean Daylight Autonomy - 21%

Daylit Area (DA300lux[50%]) - 22%

Existing Building - Blodgett



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